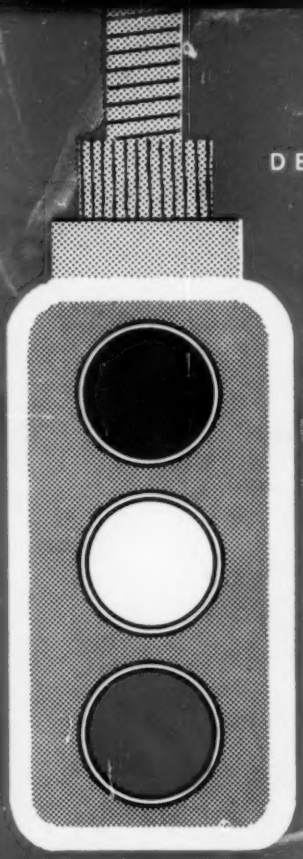
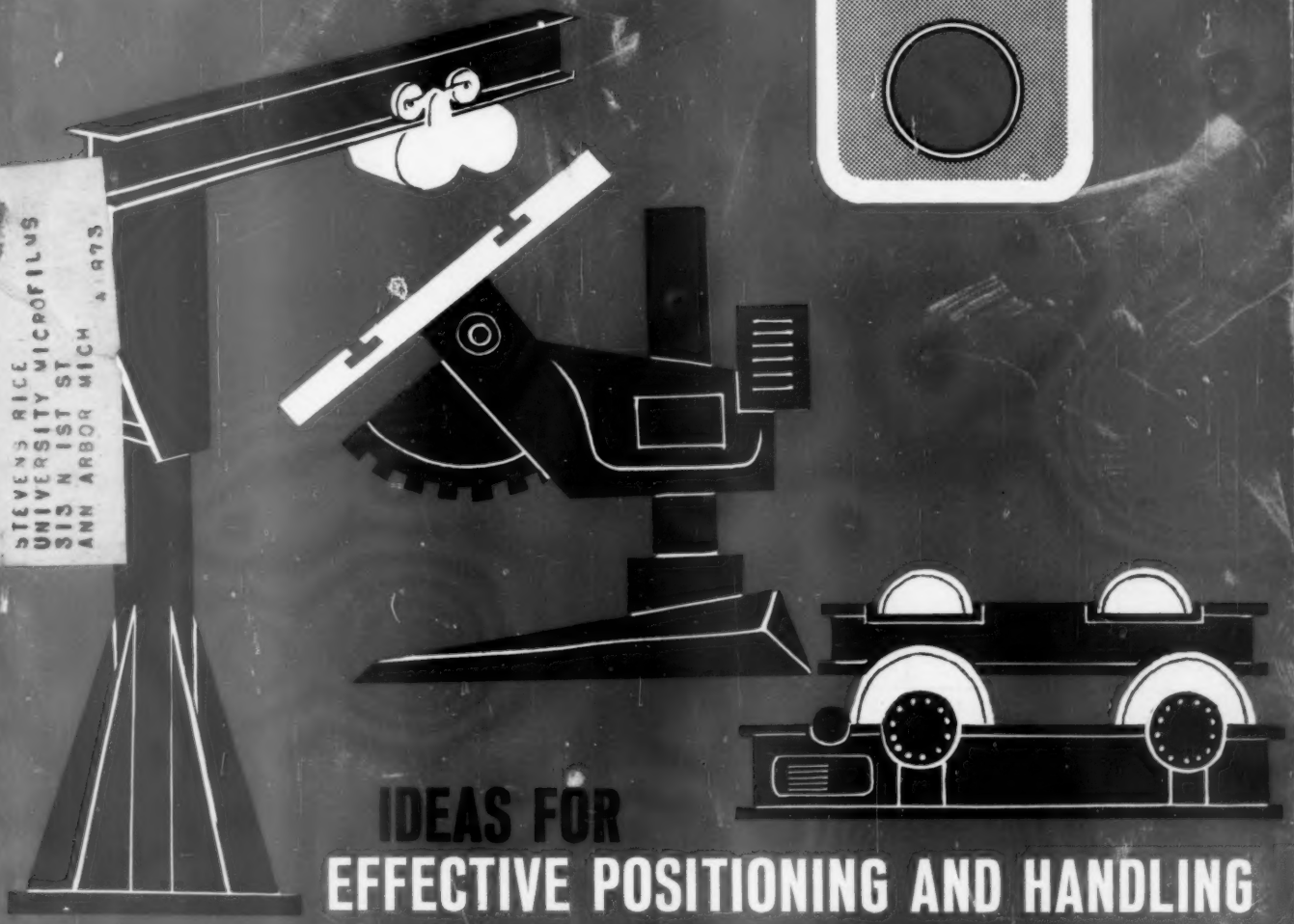
# Welding Design & Fabrication

ESTABLISHED IN 1930 AS INDUSTRY & WELDING

DECEMBER 1960





STEVENS RICE
UNIVERSITY MICROFILMS
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## IDEAS FOR EFFECTIVE POSITIONING AND HANDLING

AN INDUSTRIAL PUBLISHING CORPORATION MAGAZINE

ALSO IN THIS ISSUE

TUNGSTEN ARC CUTTING DISHED STAINLESS HEADS

A DESIGN GUIDE TO ARC WELDED ROLLS

WHY STRESS RELIEVE 9% NICKEL STEELS?

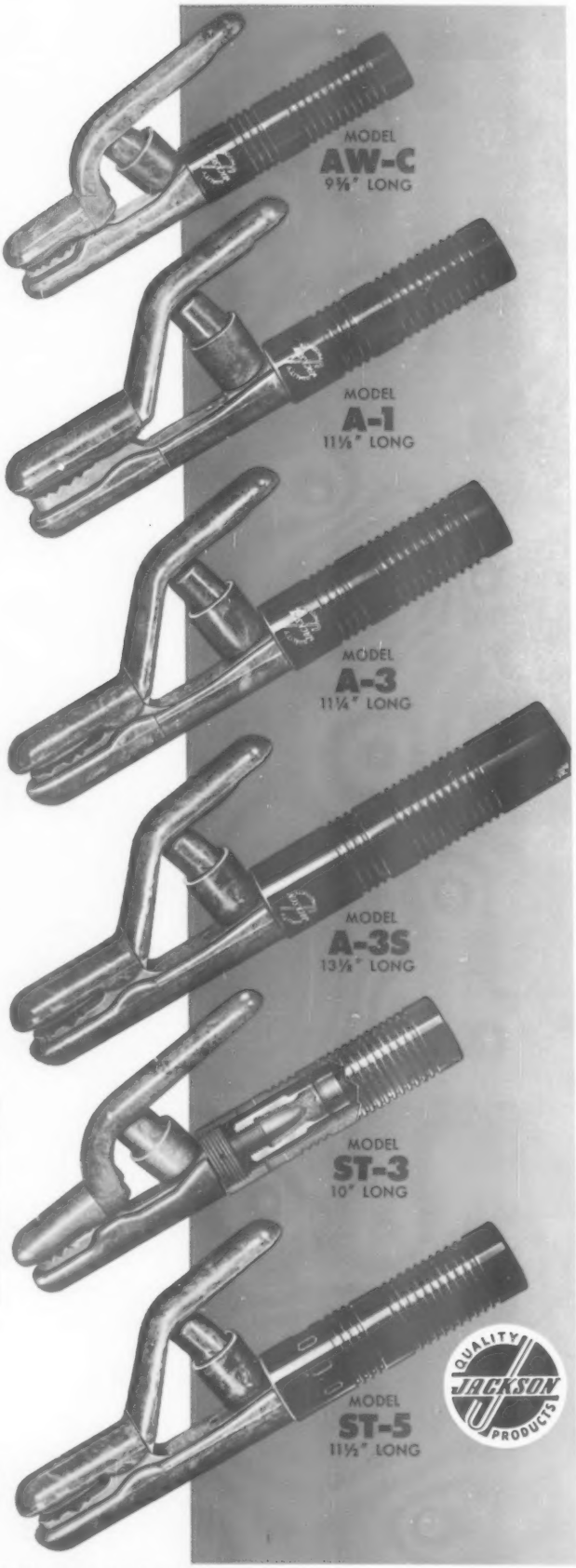
# Which ? is for ? YOU?

## *The Correct Choice is Easy with Duty-Cycle Rated Jackson Holders*

Figure the percentage of arc time in an average ten minute period of work. That's the duty-cycle your job requires. Use this important factor in determining which holder you require. Be guided by it as well as by your electrode diameter, amps, and cable size requirements. The capability of a holder to perform your duty-cycle is very important to its long, satisfactory service life.

All the Jackson holders listed are insulated copper-alloy holders. The ST-series holders feature the new trouble-free Sealed Tight cable connection device. For lighter duty-cycles, use Jackson's aluminum-alloy Featherlight electrode holders. See all the Jackson holders at your distributor. Ask for the Jackson Catalog.

| Holder Class | Model Number | Electrode Size | Amperage | Cable Size | Duty Cycle |
|---|---|---|---|---|---|
| SMALL | AW-C | 7/32" | 250<br>300 | 1<br>1/0 | 50% |
| MEDIUM | A-1 & ST-3 | 1/4" | 300<br>350 | 1/0<br>2/0 | 50% |
| LARGE | A-3 & ST-5 | 3/8" | 375<br>450 | 2/0<br>3/0 | 65% |
| HEAVY-DUTY | A-3S | 3/8" | 500 | 4/0 | 80% |



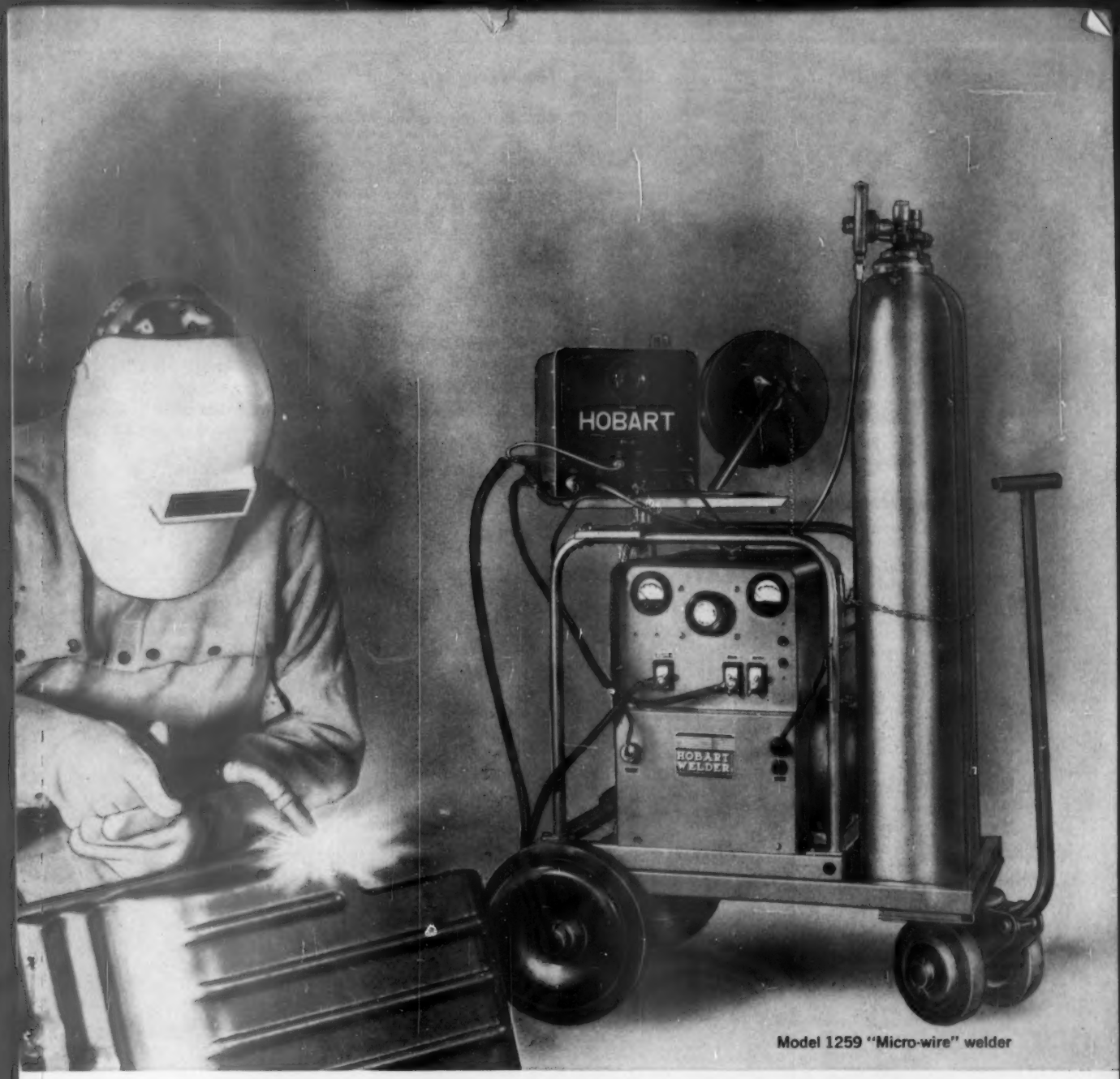

***Sold Everywhere by Better Welding Supply Distributors***

**Jackson Products**

AIR REDUCTION SALES CO., A DIVISION OF AIR REDUCTION CO., INC.

**31739 Mound Road, Warren, Michigan**

**For More Information Circle No. 42 on Reader Service Card.**




Model 1259 "Micro-wire" welder

## SQUEEZE THE TRIGGER ON THE GUN... WELDING WIRE FEEDS AUTOMATICALLY

That's Hobart's new MICRO-WIRE welder package. Think what this means in cutting costs! No time loss changing electrodes—no stub end loss—no clean up of welds necessary. Joins sheet metal and heavier sections, using small diameter wire and inexpensive carbon dioxide ($CO_2$) or argon and $CO_2$ mixtures. Actual production economies will amaze you. This new MICRO-WIRE package is an extremely versatile unit for all position welding and can be used by inexperienced as well as experienced operators. For complete details, write for bulletin DM-159.

HOBART WELDERS • ELECTRODES

**HOBART BROTHERS CO.,** Box HW-120, Troy, Ohio

Ph. FE 2-1223 *Manufacturers of the world's most complete line of arc welding equipment.*

**For More Information Circle No. 40 on Reader Service Card.**

*reader's guide to*

*for December, 1960*

**COVER:** Positioning and handling equipment, as interpreted by our artist, is truly food for thought for the cost conscious metal fabricator. This, and other positioning and handling equipment, starts paying dividends as soon as it is installed. Dividends show up in faster-made, better-quality welds; higher production and fewer equipment tie-ups; fewer rejections and fewer accidents.

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SPECIAL REPORT

## IDEAS FOR EFFECTIVE POSITIONING AND HANDLING

**33 POSITIONING: BETTER WELDS IN LESS TIME**

*Positioning equipment pays dividends as soon as it is installed. It helps make better quality welds faster and, often, pays for itself in a few years.*

**35 JIB CRANES LIFT PRODUCTION, LOWER COSTS**

*Jib cranes and hoists are economical, all-purpose handling combinations for metal fabricating plants.*

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**42 HOW REPUBLIC STEEL RATES NONDESTRUCTIVE TESTS**

*Republic Steel investigated and found electromagnetic testing of resistance welded tubing was thorough and economical.*

**47 HOW TO DESIGN A WELDED ROLL**

*These machine elements must be designed properly if they are to be economical and do the job they are supposed to do.*

**50 METALLIZING PROTECTS CONDUIT, BOOSTS SALES**

*Metallizing does three things other thread protection methods don't. It gives uniformity, rustproofing, and good appearance.*

**57 WHY STRESS RELIEVE 9% NICKEL STEEL?**

*Tests show cryogenic vessels made from this steel will withstand impact shocks and high pressures at low temperatures—without stress relieving.*

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*Here's how Frigidaire fabricates refrigerator condenser assemblies in one continuous, automatic operation.*

**66 NORTHRUP BRAZES HONEYCOMB PANELS IN 15 MINUTES**

*This aircraft company thinks its new process could replace the 3-to-15 hour furnace brazing methods now used.*

**68 WELDED ALUMINUM TOWER WITHSTANDS HURRICANE-FORCE WINDS**

*Tapered octagonal construction uses extruded shapes to reduce the weight of an 85-foot electrical transmission tower.*

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Circle No. 54 on Reader Service Card——→

# World's biggest power shovel welded with M&T Murex electrodes

Picture this 6,588,000 lb. giant on the 50-yard line of a football field. It could dig a 65 cu. yd. dipper-full in one end zone, lift it 140 feet high, swing its 170-ft. boom and pile the 100 ton load on a 12-story building in the opposite end zone. For many of the shovel's most important weldments, the builder, Marion Power Shovel Co., put its trust in M&T Murex electrodes – products of METAL & THERMIT CORPORATION, General Offices: Rahway, New Jersey.

M&T MUREX
PRODUCTS FOR BETTER WELDING

# ATLAS... FIRST AGAIN!

## NOW YOU GET 18% MORE CHIPPING EFFICIENCY ALONG WITH OTHER BIG ATLAS ADVANTAGES!

Everybody benefits from an improvement like new "WIDE BLADE," the welder, the owner of the business and even Atlas because new names will be added to the thousands already on our customer list.

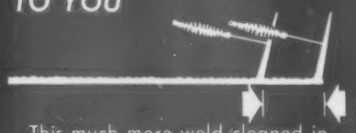
Why is Atlas always first with chipping tool innovations? It's simple as this—We are specialists. This is our principal business, not a side line. We are constantly looking for ways to improve weld cleaning techniques—to speed the job and do it better at less cost. Every member of the famous Atlas Line now has "WIDE BLADE," tool

Ask your welding supply dealer to show them to you.

## 33 MODELS THEY ALL HAVE WIDE BLADES

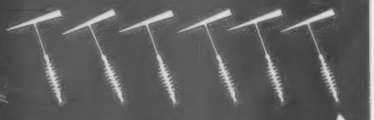
# WIDE BLADE

## HERE'S WHAT 18% MORE BLADE WIDTH MEANS TO YOU



This much more weld cleaned in the same amount of time with the same amount of effort.

Sharpen less often. Tools last longer and non-productive time saved.



It's like getting a free tool every time you buy five, because the new wide blades wear longer.

ATLAS WELDING ACCESSORIES INCORPORATED
707 E. LEWISTON
FERNDALE 20, MICH.

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Welding Design & Fabrication

FRANCHISE CIRCULATION

BPA

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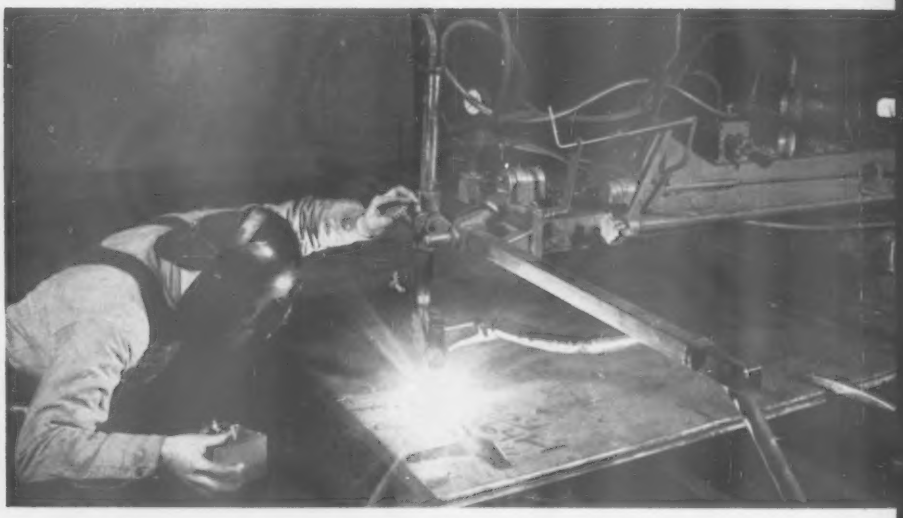
Circle No. 55 on Reader Service Card. →

# World's tallest structure relies on M&T Murex electrodes

Almost 1000 tons of steel stretching 1676 feet into the sky! This new television transmission tower for KFVS-TV, Cape Girardeau, Missouri, is the tallest structure man has ever built. It's 204 feet taller than the Empire State Building, has solid steel legs up to 7½" in diameter, can withstand winds of over 100 mph. In welding the 30-ft sections of this triangular tower of strength, Dresser-Ideco Company put its trust in M&T Murex electrodes... products of METAL & THERMIT CORPORATION, Rahway, New Jersey.

M&T MUREX
PRODUCTS FOR BETTER WELDING

*shearing ¾ inch plate at Jones & Laughlin's steel warehouse*



*tungsten arc cutting stainless steel at Joseph T. Ryerson's steel service center*

# New equipment improves service at steel warehouses

**STEEL WAREHOUSES supply steel to customers when time is too short, quantity too small, or items too specialized for mill production and delivery. These modern, well-equipped warehouses or steel service centers, as they are sometimes called, are strategically located throughout the country. Their customers range from industrial giants to one-man shops.**

### SHEARING AND FLAME CUTTING

Typical warehouse is the new Cleveland, Ohio, unit of Jones & Laughlin's Steel Warehouse Division. This warehouse has 140,000 square feet of floor space and cost $1½ million. It is equipped with special machinery for handling all types of bars, structurals, plates, and sheets. It also has the latest equipment for tailoring these to exact customer specifications. Typical of this equipment is a shear which can cut ¾ inch plate (shown above) and the latest multiple-torch electronically-controlled flame cutting machines.

### TUNGSTEN ARC CUTTING

Another steel supplier, Joseph T. Ryerson & Son, Inc., recently added new equipment to improve service. Ryerson reports they installed tungsten arc cutting equipment to cut stainless plates at four of its steel and aluminum service centers. The company says the process turns out stainless rings, circles, and irregular shapes in a hurry and gives smoother, cleaner edges than powder cutting. It cuts stainless up to 2½ inches.

Ryerson's engineers supervised the installation of the equipment and the training of the operators.

*more news on page 9*



**Circle No. 56 on Reader Service Card.** ⟶

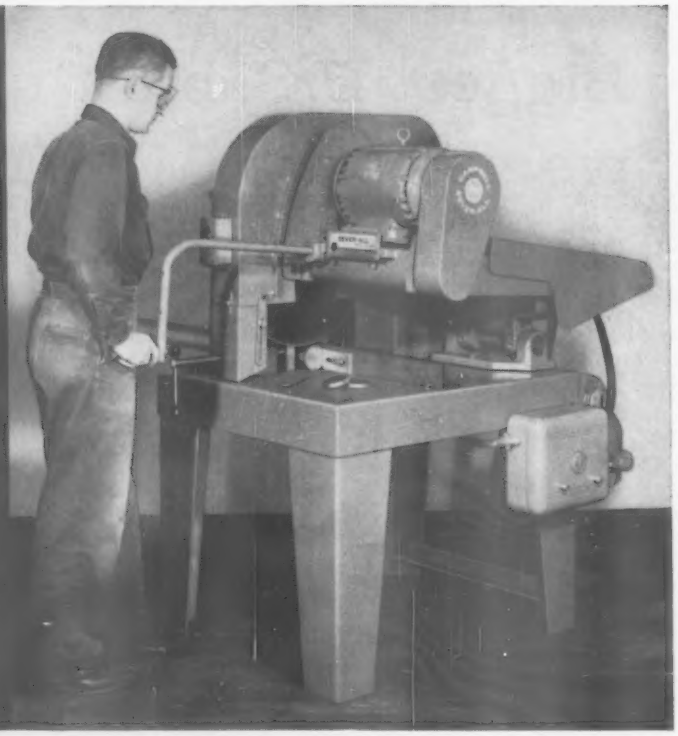
# Biggest U. S.-built ship welded with M&T Murex electrodes

The *Princess Sophie*, built by Bethlehem Steel Company, has the latest electronics, a foam fire-protection system, a fully equipped hospital, air-conditioned quarters—all making this one of the safest and most luxurious supertankers ever built. When loaded, it has a greater displacement (100,000 tons) than any passenger or military ship afloat. In building the Princess Sophie, welding was with Murex electrodes—products of METAL & THERMIT CORPORATION, General Offices: Rahway, New Jersey.

M&T MUREX
PRODUCTS FOR BETTER WELDING

# NEW!

# GREATEST CUT-OFF CAPACITY IN ITS CLASS!



• This newest addition to the Sever-All line of abrasive cutting machines—the Model 2-A—provides greater cutting capacity and more flexibility than any other machine in its class. Check these important advantages:

**Big capacity** • cuts 4″ round or square solids, 6″ diameter tubing or standard pipe, 6″ x 1″ flat stock, 6″ angle iron and 8″ channels. Cuts practically all metals.

**Fast operation** • accurate cuts at the rate of 2 to 3 seconds per square inch. For instance, you can cut a 4″ bar of hardened steel in 45 seconds, or a 2″ pipe in 3 seconds.

**Power oscillation** • oscillation—the forward and backward motion of the cutting wheel as it is fed down into the cut—gives you extra cutting capacity without excessive horsepower load on your power lines. It also contributes to longer wheel life and reduced operator fatigue.

**Quality cuts** • clean, smooth cuts, even on large sections, because wheel oscillation provides cooler cutting action.

**Economy** • Sever-All abrasive cutting wheels, developed specially for the Model 2-A, assure you of lowest cost per cut.

**Safe** • wheel guard provides complete operator protection.

**Minimum maintenance** • all bearings are the pre-lubricated and sealed type. Clean, simple machine design permits easy housekeeping.

**Built to last** • rugged machine bed and rigid castings make the Model 2-A first choice for heavy-duty jobs.

## VARIETY OF WORK HOLDERS GIVES UNUSUAL VERSATILITY

V-block with quick-action clamp

Angle-cutting work holder

2-way clamp for irregular shapes

Choose the work holders you need from several optional arrangements. These include the vise-type holder shown on the machine at top, plus the V-block, angle-cutting and 2-way clamp fixtures above. All fit interchangeably on the Model 2-A Sever-All. Screw-type and quick-action clamping also may be used interchangeably.

***Write for details*** **on the new Model 2-A Sever-All abrasive cutting machine. Ask for Bulletin DH-299**

ACCO

# SEVER-ALL ABRASIVE CUTTING MACHINES

**Allison-Campbell Division, American Chain & Cable Company, Inc.**

925 Connecticut Avenue, Bridgeport 2, Conn.

**For More Information Circle No. 6 on Reader Service Card.**

## Lincoln Awards Design Prizes

CLEVELAND: The annual awards for engineering undergraduate papers on welded machine and structural design have been announced by the James F. Lincoln Arc Welding Foundation. A total of $5000 in 46 awards were made to students in 21 colleges.

Awards were made for papers explaining how the efficient application of welded steel to the design of a machine or structure contributed to its improvement or cost reduction. First award of $1250 went to Glenn F. Balfanz, Northwestern University, for redesigning a pump discharge head.

## All-State Helps With Distributor Publicity

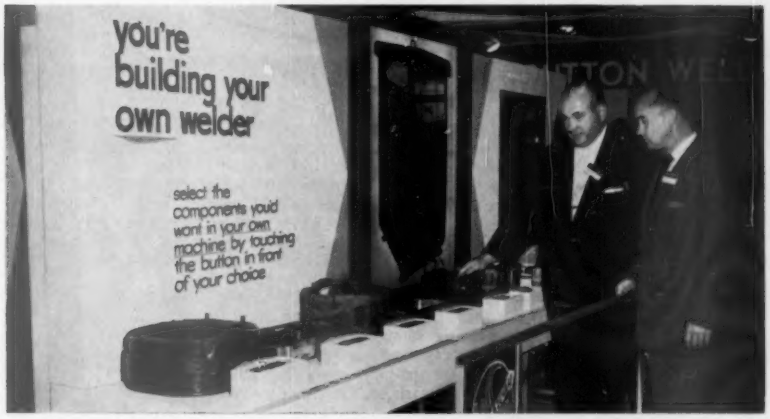
WHITE PLAINS, N. Y.: All-State Welding Alloys Co., Inc., is offering its distributors the full use of its Publicity Department. The move was made to increase distributor publicity and sales on the local level.

All-State will give its distributors advice on how to handle publicity in sales promotion campaigns, how to write and place articles, how to get good photographs, how to select a magazine list, and how to handle inquiries. Direct mail promotion, trade shows, and local public relations are other topics on which advice and guidance will be available.

## Kennedy Forms Welded Products Department

COHASSET, MASS. The formation of a Commercial Welded Products Department has been announced by D. S. Kennedy & Company. Clyde F. Mooney, president, said the move is part of a policy of diversification in commercial fields for his company which makes large antenna systems.

The new department will do subcontract work in aluminum and steel weldments.


you're building your own welder
select the components you'd want in your own machine by touching the button in front of your choice

**GEORGE KEMPER,** manager of A. O. Smith's Welding Products Division (left), discusses components that Dave McDaniel, chief inspector at Sinclair Refining Co., would have used in building his own welder.

## Metal Show Visitors Build Their Own Welders

PHILADELPHIA: The A. O. Smith Corp. used this unique exhibit to show 1960 Metal Show visitors the components that go into its arc welding machines.

Visitors were given a chance to build their own machines—figuratively, at least. They selected four critical internal components of a welder (coils, fan, fan motor, and capacitors) by pressing buttons to light their choices. They selected each component from three unmarked alternatives, one an A. O. Smith product.

*more news on page 84*

Largest Shovel

Tallest Structure

Biggest Tanker

Here are three fine achievements with steel . . . shovel, tower, ship . . . each a leader, each welded with M&T Murex electrodes.

Dozens of demanding jobs like these . . . and hundreds of everyday applications . . . have established the Murex reputation.

When you think of electrodes, think of your M&T Murex representative—a specialist with a wealth of background and training to put at your service. Or look into the Murex Electrode Selector for a complete listing of over 1000 Murex types and sizes. Copies available from: METAL & THERMIT CORP., Advertising Dept., Rahway, N. J.

M&T MUREX welding products

METAL & THERMIT CORPORATION
General Offices: Rahway, New Jersey
Circle No. 57 on Reader Service Card.

Another Test System at work...

*Magnaflux KCH-3D provides easily mobile in-plant weld tests on heavy equipment. One of the many Magnaflux models, starting with hand-portable kits at $195.*

# To Prove Your Structural Welds at Lower Cost — Include Magnaflux

Magnaflux-Magnaglo *magnetic particle* inspection offers you the lower cost, fully accepted test to find *all* weld cracks, as well as lack of penetration, lack of fusion, etc. (Actual cost is 6½ cents or less per foot of weld, including the cost of two inspectors and moving of scaffolding.) This test offers great savings, compared to other tests or to the disastrous cost of failure.

Magnaflux-Magnaglo weld testing is now specified by several highway departments and safety authorities for bridges and other public structures, during erection—even including shop-weldments. This is a result of its proven safety and savings on building structural members, large cranes and derricks—oil rigs and pipelines and plant equipment, and heavy fabricated machinery.

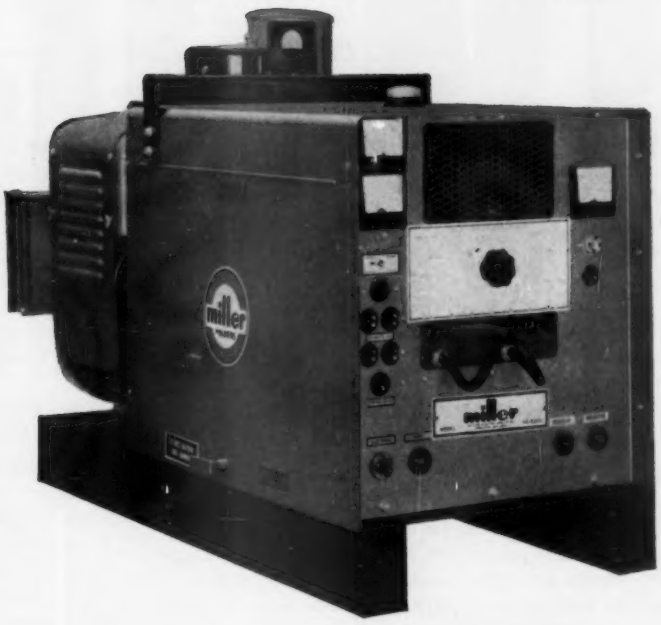
The cost to you? *Very little.* We will sell you the test units specially selected for your needs (starting as low as $195) or, for a very modest fee, take the whole testing job off your hands with our Field Testing Service, operating out of 15 principal cities.

Write or call Magnaflux Corporation, 7348 W. Lawrence Avenue, Chicago 31, Illinois.

MAGNAFLUX CORPORATION
TEST SYSTEMS
A SUBSIDIARY OF GENERAL MILLS

For More Information Circle No. 51 on Reader Service Card.

# NEWEST OF THE GREAT NEW MILLER WELDER/POWER PLANTS




**AD-225-L**
**GASOLINE ENGINE-DRIVEN AC/DC WELDER/POWER PLANT**

miller WELDERS

**This is as close to being "an all-around hand" as you're ever likely to find. For instance:**

**A-C or D-C WELDING. The AD-225-L produces 300 amperes at 30 volts a-c or 225 amperes at 30 volts d-c – both at 100% duty cycle. Ample open circuit voltage gives superior results with a-c, d-c or a-c/d-c electrodes.**

**METALLIC INERT GAS WELDING. Using the d-c side of the AD-225-L, and with new style hand guns feeding small diameter wire from spools, aluminum, mild or stainless steel may be welded by the MIG process. Power for the gun is provided by the 115 volt d-c outlet.**

**A-C POWER PLANT. As an a-c power plant, this model produces 7 KW of 115/230v single phase 60 cycle current. In areas without electric power, the AD-225-L has proved to be a reliable and economical source of current for lights, appliances and tools.**

**AUXILIARY D-C POWER. While welding, the AD-225-L delivers 1 KW of 115v d-c which is ample for operation of flood lights, power tools, etc. Other uses to which this versatile model has been put most successfully include thawing of frozen water pipes, warming of viscous fluid for pumping, battery charging and, with addition of model HF-200 high frequency unit, tungsten inert gas welding.**

***Complete information sent promptly.***

**miller** ELECTRIC MANUFACTURING CO., INC., APPLETON, WISCONSIN

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**For More Information Circle No. 60 on Reader Service Card.**

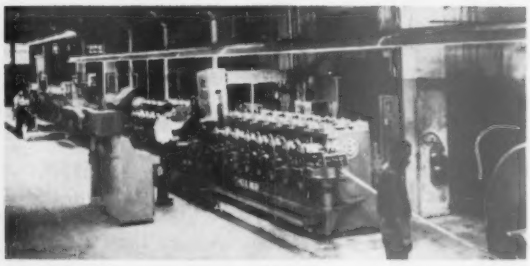
# WELDING MANAGEMENT

*watches these developments*

**A DEPARTMENT FOR TONNAGE,** or on-site sales of industrial gases—primarily oxygen, nitrogen, hydrogen, and argon—has been formed by Air Reduction Sales Co. R. E. Lenhard, Airco president, says the on-site, tonnage gas plants have cut the cost of tonnage oxygen in the steel industry by 80 percent in the last 10 years and has made low cost oxygen an important and useful raw material for the chemical and non-ferrous metallurgical industries. Airco estimates daily consumption by these industries at about 8,000 tons.

**A $500,000 EXPANSION** of productive facilities, including a new 21,000 square foot plant and a 6,000 square foot addition to its existing welding electrode plant has been announced by Marquette Mfg. Company, Minneapolis. Dr. Frank W. Scott, plant manager, says this will double the firm's capacity for producing welding electrodes. By drawing its own wire in new automatic Swedish equipment, the company will save $100,000 yearly in production costs. Ground will be broken in January.

**A WELDING TRAINING FILM** is available from Air Reduction Sales Co. "Fundamentals of Manual Shielded Arc-Welding Techniques" is a 16mm film in full color and sound. Adapted from General Electric Company's previously released six-film series, "Inside Arc-Welding", the Airco film has been edited to two reels. It runs for 45 minutes.



**ELECTRONICALLY WELDED** copper tubing, the first to be produced commercially in this country, is rolling off this production line at Tubotron, Inc., Newark. The high-speed operation, which employs the patented Thermatool process, makes tubing with outside diameters from ½ to 3½ inches and with wall thickness from 0.017 to 0.140 inches. The company can also make round or shaped tubing from all other metals, including the exotic alloys.

**A NEW COLUMBIUM** (niobium) alloy, F-48, is being welded and machined by Ling-Temco Electronics, Inc., Dallas, in connection with the Air Force Refractory Metals Structural Development Program. This program involves fabrication and testing of a structural component under simulated re-entry environments. Columbium may be one of the heat-resistant metals sought for high Mach number flight since it retains usable structural properties at 2,500°F., compared to 1,500°F. for steel and about 2000°F. for nickel alloys.

**A FINANCING PLAN** that will allow purchasers of resistance welding machines to lease instead of buy has been developed by Thomson Electric Welder Co., Lynn, Mass., and the General Electric Credit Corp. There are substantial tax advantages to leasing, says R. P. Hedblom, Thompson's president. He explains the leasee may include his leasing costs as a tax-deductible operating expense if he does not have equity in the equipment and does not intend to in the future.

**JAPANESE IMPORTS** from the United States in 1960 will total approximately $1,250 million, according to the United States-Japan Trade Council, Inc. This is more than one-third higher than the 1959 level and is about twice the value of goods imported by Japan in 1952. Here are some figures on American exports to Japan that will interest people in the welding industry:

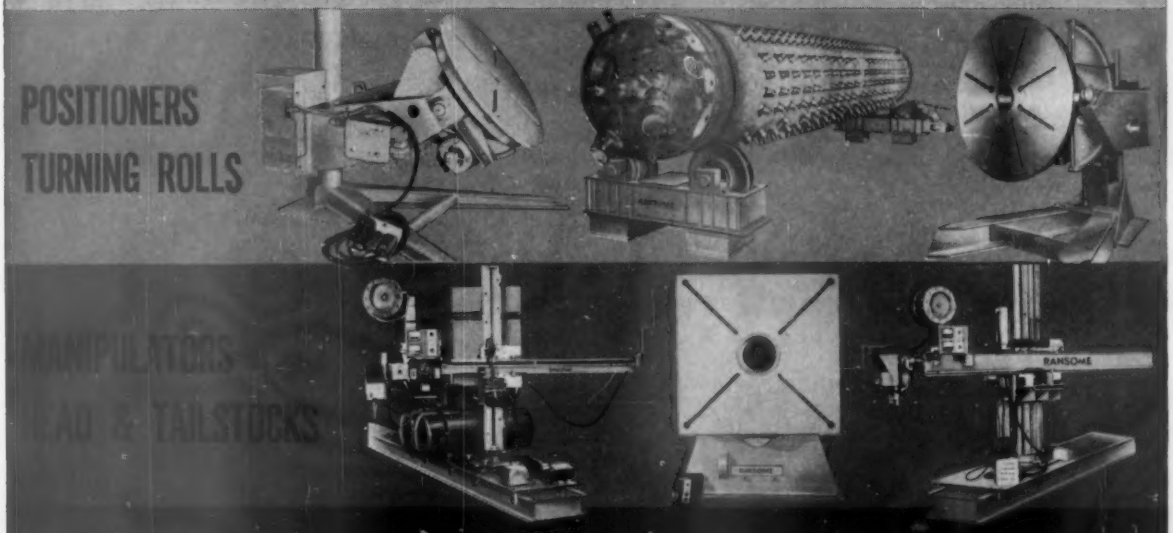
| PRODUCTS* | 1955 | 1956 | 1957 | 1958 | 1959 |
|---|---|---|---|---|---|
| Welding rods | $155 | $357 | $562 | $383 | $436 |
| Generators | 181 | 132 | 638 | 356 | 296 |
| Steam Turbine generator sets | 174 | 7,389 | 362 | 5,904 | 7,225 |
| Welders and welding sets | 54 | 226 | 508 | 262 | 214 |
| Generator sets, diesel | 151 | 728 | 367 | 441 | 280 |
| Non-rotating rectifiers | 1 | 30 | 361 | 234 | 136 |
| X-ray apparatus | 75 | 67 | 220 | 152 | 104 |
| Hydraulic presses | 153 | 493 | 548 | 966 | 2,089 |
| Mechanical presses | 111 | 0 | 175 | 482 | 45 |
| Bending and roll-forming machines | 20 | 412 | 732 | 426 | 1,207 |
| Punching, shearing machines | 23 | 164 | 223 | 356 | 303 |
| Welding machines | 37 | 42 | 72 | 863 | 62 |

* *in thousands of dollars*

# NOW YOU CAN RENT

## RANSOME POSITIONING EQUIPMENT

**Rent the equipment you need – when you need it – for as long as you need it.**




***Rent it because...***

no capital outlay is required to give you immediate use of fine, rugged Ransome positioners, manipulators, turning rolls, head and tailstocks . . . furthermore, you can write off the entire rental you pay for this equipment—no need to rely on depreciation rates.

***Rent it because...***

the savings introduced through the use of new and modern positioning equipment on most jobs will far exceed the low rental cost.

***Rent it because...***

equipment that you rent need never sit idle, wasting space, adding overhead. The day you're finished with it, ship it back to us!

*YOU CAN RENT a $2000 positioner and start to make profits immediately... for as little as $1.25 per hour... without capital outlay!*

**For further information send in coupon...**

Ransome Company
*Division of Big Three Welding Equipment Co.*
Scotch Plains, New Jersey

*RANSOME... THE PIONEER IN POSITIONING FOR WELDING*

RANSOME COMPANY, Scotch Plains, New Jersey

☐ I am interested in renting Ransome Equipment: Please quote rates for:

Type:_____ Approx. size or capacity:_____

☐ I anticipate requiring this equipment on or about_____ (date)

for approx._____ months / weeks ☐ Have your sales engineer contact me ☐ Please send Ransome literature

Name:_____

Company_____

Address_____

City_____ Zone_____ State_____

**For More Information Circle No. 63 on Reader Service Card.**

National of ...california
FIVE STAR PAK... GENERAL
$112.00
★ Made to work better and to last longer
★ Constructed of heavier bar stock
★ Designed for maximum safety
★ Extendible for your future needs.
★ Its fine quality matches its appearance.
This is the Very Finest...
NATIONAL

# why a five star general?

●

for general construction, maintenance and shop use where the medium duty outfits are limited in range and capacity————

●

slightly higher ($112.00) than light duty outfits

## to be sure —

●

## but above all remember —

That of the many outfits sold today there is only one National of ...california made with the same extra care that typifies our entire line.

Including a full range welding torch with three tips—a cutting attachment and one tip—a pair of standard sized single-stage oxygen and acetylene regulators with two inch brass content and working pressure gauges.

Yes—it can easily be extended with larger or smaller size tips and nozzles—or multi-flame nozzles if required. Contact your nearest authorized National of ...california dealer or write directly to the factory for additional information.

50 National of ...california

should your operations call for a lighter outfit may we recommend the popular NATIONAL FIVE STAR CADET PAK $89.50

561

NATIONAL welding equipment company... 218 fremont street san francisco 5 california

For More Information Circle No. 62 on Reader Service Card.

**Lewis Welding & Engineering Company of Bedford, Ohio,** welded this annulus for Clark Bros. Co. of Olean, New York, producers of industrial gas turbine engines.

# Here's a dissimilar alloy weld that's reliable above 1000° F...

When this liner for an industrial gas turbine annulus is hooked up to a combustion chamber, it will face temperatures over 1000°F. That's how hot its metal surfaces get when they channel high temperature combustion gases toward whirling turbine blades.

The welding of these dissimilar alloy parts, one heavy, the other light, becomes really important when operating conditions are considered. Shutdowns are rare in industrial gas turbine service, and welds must last for years. But the Inco-Weld* "A" Electrodes used here eliminate the possibility of weld failure.

**No heat problems**

That's because the Inco-Weld "A" deposit is both ductile and strong. In all likely combinations, it is compatible with high-temperature-type base metals.

Inco-Weld "A" Electrode, remarkable for its ability to weld 97% of all dissimilar alloy combinations, is *equally remarkable* for its ability to provide dissimilar alloy joints capable of long-term resistance to heat and corrosion.

**Operability is excellent**

With Inco-Weld "A" Electrode it's easy to produce ductile X-ray quality welds. You can weld in all positions, the arc is spray-type, slag removal is good, and spatter is at a minimum.

Inco-Weld "A" Electrode is supplied in 3/32, 1/8, 5/32 and 3/16 inch diameters, packed in 5-lb sealed asphalt-lined containers for convenience and protection.

Plan to use Inco-Weld "A" Electrode the next time you weld dissimilar alloys. For information on the weld properties you can expect, write for our 6-page brochure, "Now You Can Weld 97% of All Dissimilar Alloy Combinations with One Electrode."

*Inco trademark

Combustion chamber liner is made of Inconel* nickel-chromium alloy and other high temperature alloys, production welded with Inco-Weld "A" Electrodes.

**HUNTINGTON ALLOY PRODUCTS DIVISION**
The International Nickel Company, Inc.
**Huntington 17, West Virginia**

**INCO WELDING PRODUCTS**
TRADE MARK
**electrodes • wires • fluxes**

**For More Information Circle No. 41 on Reader Service Card.**

S-M-S
Adjust-A-Angle Adapters with Adjust-A-Pressure Holders solve many welding problems
Change from one electrode spacing to another in a matter of minutes—with the same set-up.
FREE: Write for descriptive data on complete line of resistance welding products.
Another step to better welding.
S-M-S Corporation
2254 Cole Avenue
Birmingham, Michigan

to get the best joint, use the right

FLUX

you name it—ALL-STATE has it

ALL-STATE makes quality fluxes for torch and soldering iron applications on all commercial metals . . . in the form you prefer: liquid, paste, powder, flux cored solders, flux coated rods. Working temperatures range from 300F to 2200F. Designed for maximum wetting action, minimum fuming. For instance:

**DUZALL** . . . a new liquid flux for all soft solders, all metals (except light metals). DUZALL eliminates pre-cleaning, increases capillary action, leaves minimum deposit. Comes in handy 4 oz. refillable dispenser-type plastic containers, and in larger units.

**#11 BRAZALOY®** . . . a paste or powder flux for use on 14 ferrous and bronze alloys. Wide temperature range: 1200F to 2200F. Non-corrosive, non-fuming. Also available extruded on Nickel Silver welding rods.

**#31 BRAZALOY®** . . . a highly active aluminum brazing flux that gives maximum wetting action, excellent capillary flow. Protects surfaces from discoloration, requires less after-cleaning. An outstanding temperature indicator.

**S200 SILVER BRAZING FLUX** . . . melts at 600F, becomes transparent at 1100F, protects heated base metal to 1800F. Induces excellent capillary action and flow of silver alloys.

**Send for free copy of 54-page Instruction Manual and for information on custom coating your welding rods.**

All-State's JET FLUX® and JET FLUX DISPENSER® on production line at Griggs Manufacturing Co. Acetylene and Jet Flux mixed and fed automatically from Dispenser.

Distributor Stocked, convenient to buy. Economical to use.
ALL-STATE WELDING ALLOYS CO., INC., White Plains, N. Y.
Call WHite Plains 8-4646 or write for nearest distributor

For More Information Circle No. 5 on Reader Service Card.

# LIBRARY

*of welding*

## ASME Code Simplified

*"Unfired Pressure Vessels—The ASME Code Simplified" by Robert Chuse. Order from F. W. Dodge Corp., 119 West 40th St., New York City, 154 pages, $8.75.*

This is the new, fourth edition of the only comprehensive, simplified guide to the ASME Boiler and Pressure Vessel Code.

The author, a commissioned inspector of pressure vessels, pinpoints basic causes of accidents and failures, comments on corrosion and stress failures, cautions on design pitfalls, simplifies welding procedures, explains effects of welding heat, and offers steps for weld inspection.

The handbook outlines and clarifies problems in shell thickness, material classification and identification, openings and reinforced openings, testing procedures, inspection and stamping, welded repair methods, work-flow schedules, mill and warehouse orders, and shop organization.

The book contains 66 tables, charts, and diagrams designed to give complete accurate Code calculations in minutes.

## Welding Metallurgy

*"Welding Metallurgy," American Welding Society, 33 West 39th St., New York 18, N. Y., 122 pages, $2.00.*

This condensed, pocket-size textbook on ferrous and nonferrous welding metallurgy was prepared and reviewed by metallurgists in this country. It contain 45 illustrations, 25 tables, and 25 diagrams.

## Ultrasonic Welding

*"Ultrasonic Welding," American Welding Society, 33 West 39th St., New York 18, N. Y., 38 pages, $1.50.*

This booklet is a reprint of material published in Section III of the *Welding Handbook* (4th Edition). It contains sections on fundamentals of the process, the metals which can be welded, welding techniques, weld characteristics, quality control, equipment, and application.

A bibliography, index, and 29 illustrations are included.

*continued on page 21*



Circle No. 46 on Reader Service Card. ⟶

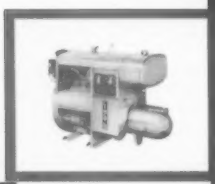
LINCOLN WELDERS

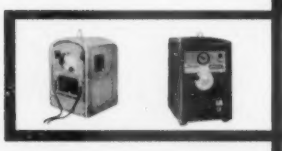
*three phase rectifier* ***IDEALARC R3M®***

*DC arc welders*

*Announcing a new family of* ***LINCOLN WELDERS***

- . . . full range of sizes, 300 amp to 650 amp
- . . . generous capacity in each size
- . . . ideal arc characteristics
- . . . rugged, maintenance-free, construction
- . . . surprisingly low price





IDEALARC
R3M-400
LINCOLN
WELDER

*A great new addition to the World's Most Popular Line of Welders*

# Lincoln's all new IDEALARC R3M

*three phase rectifier DC arc welder*

With such a large group of Lincoln welders already available to meet the needs of welding users, you might wonder why the new Idealarc R3M is necessary. Here is the reason—on some applications the following are either necessary or highly desirable:

1. DC welding current for small sized electrodes or stainless steel, alloy, non-ferrous or other special electrodes.
2. A current range broad enough to handle both semi-automatic equipment and small manual electrode.
3. A balanced, three phase input current.
4. Quiet operation.
5. Low idle currents.
6. High power factor and efficiency.

Only in a three phase rectifier, such as the new Idealarc R3M, can all these features be incorporated into one machine.

In addition to these features, the rugged construction of this new Lincoln welder promises to set new high standards of trouble-free operation and minimum maintenance. The highly efficient silicon rectifiers do not age or deteriorate and are exceptionally well protected against overloads with special electrical circuitry.

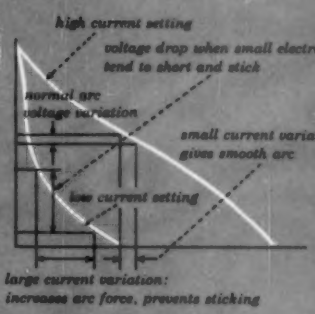
## APPLICATIONS

**For Manual Welding**—The Idealarc R3M will handle *any* manual electrode. Its output characteristics produce smooth, steady, spatter-free welding at high currents and strong current surges that prevent sticking at low currents. In the production plant, maintenance shop, or the construction site, your operators will enjoy using the Idealarc R3M.

**For Semi-Automatic Welding**—The larger sized Idealarc R3M's, equipped with the optional "Power Pack", can be used as a power source for Lincoln's submerged arc Squirt Welders or other semi-automatic equipment. Equipped with two sets of leads, one Idealarc R3M can be used alternately for both manual and semi-automatic welding—double duty for added versatility and reduced capital investment!

## PERFORMANCE FEATURES

**Output Characteristics**—Idealarc R3M has unique and important built-in characteristics that make welding easier. First, to prevent sticking with small electrodes, the machine produces a surge of current as arc length is shortened. This surge, seen as the "toe" of the low current settings curve, eliminates the need for separate switches and circuits to prevent sticking.


high current setting
voltage drop when small electrodes tend to short and stick
normal arc voltage variation
small current variation gives smooth arc
low current setting
large current variation: increases arc force, prevents sticking

Second, for smoothest operation of large electrodes, the output curve at high current settings is quite flat and relatively unaffected by arc length variations. There is minimum spatter and "wild arc" action.

Third, for maximum arc stability, R3M's choke coil is designed so that any electrode can be run at any appropriate current, using any technique, with complete freedom from pop-out.

**Input Power**—The Idealarc R3M draws a balanced three phase current from the lines. Particularly important where machines are installed on existing lines, this characteristic usually permits direct replacement of obsolete welders with new Idealarc R3M's without installation of additional wiring, switches or fuse boxes.

Starting and idle current on Idealarc R3M welders is practically nil, amounting to less than 15% of the rated input current. On field applications, the number of machines which can be powered by one generator set depends only on usable rated current, not starting current.

Power factor is high and idle amps low on the Idealarc R3M. Efficiency is excellent. Overall, for machines operating at rated load, efficiency is about 75%. Note that the silicon rectifiers contribute considerably to this. They are about 4 times as efficient as selenium rectifiers.

You'll find the Idealarc R3M welder truly ideal from the standpoint of every input power consideration.

**Low Cost**—After you've checked the performance and construction features of the Idealarc R3M and convinced yourself that it is tops in its class, then look at its price. You'll be pleasantly surprised.

LINCOLN WELDER

IDEALARC R3M

*Three Phase Rectifier, DC Arc Welder*

## CONSTRUCTION DETAILS

**Current Control** — An easily turned crank on the front of the machine provides continuous current control over the entire range of the machine by a movable core in the reactor windings. The mechanical system used to move the core is rugged, noise-free, smooth and free of creeping problems.

**Polarity Switch** — Durable, silver-plated contacts with sturdy mechanical construction assure thousands of trouble-free polarity changes.

**Case** — The recessed front prevents damage to external controls. Output studs are recessed even further and separated to eliminate accidental shorts. Strain relief loops prevent needless wear on output studs and loose connections that dissipate output and cause operator annoyances.

**Lift Bail**—Whether you move your machine once or hundreds of times, the convenience of the sturdy lift bail will be apparent. Welded directly to the sturdy frame of the machine, the lift bail is attached permanently regardless of how severely it is used.

**Signal Light** — Red light indicates machine is on; prevents accidental idle operation during non-working hours.

**Line Contactor Starter and Overload Protection** —Operated by a push button on the front panel, a heavy duty magnetic contactor energizes the machine. Protective circuits automatically disconnect the welder from the line in the event of overload, overheating from any cause, or input power failure. This well-proved protective system makes it virtually impossible to burn out the Idealarc R3M.

**Weatherproofing** — Louver design prevents entry of rain, or other falling liquids, into the machine. Also, electrical parts receive a double dip in a special insulating material after they are assembled and interconnected to repel the attack of salt air or other corrosive atmospheres.

**Silicon Rectifiers** — After years of testing, Lincoln engineers are convinced that the silicon diodes and circuitry employed in the Idealarc R3M provide unequalled rectifier performance and life. To the well-established efficiency and freedom from aging of silicon diodes, Lincoln has added exceptionally large safety margins and unique protective circuits to overcome the problem of overvoltage failures that plagued silicon rectifiers in the past. The results are outstanding.

**Windings** — Most of the windings in the Idealarc R3M are aluminum, which permit a compact, lightweight design. As in other Lincoln welders the aluminum-copper connections are flash-butt welded and sealed forever in a protective coating. There are no mechanical aluminum-copper joints.

**Fan and Cooling System** — A large fan moves generous quantities of cooling air through the machine. Clean air flows in at the top of the welder, passes first over the rectifier heat sinks, then down over the windings, and exhausts through louvers in the front panel. A large safety factor in temperature rise, designed in the machine, permits the use of the Idealarc R3M on even unusually severe applications.

## SPECIFICATIONS

**Idealarc R3M**

| Model / Type (60 cycle / 50 cycle) | | K-1149 / K-1153 | K-1150 / K-1154 | K-1151 / K-1155 | K-1152 |
|---|---|---|---|---|---|
| NEMA Rating: | Current | 300 amps | 400 amps | 500 amps | 650 amps |
| | Arc Voltage | 40 volts | 40 volts | 40 volts | 40 volts |
| | Duty Cycle | 60% | 60% | 60% | 60% |
| Current Range | | 30-375 | 40-500 | 50-625 | 65-750 |
| Input Power: | Voltages * | 208, 220/440, 220/550 volts | | | 208 220/440 |
| | Cycles | 60 and 50 | | | 60 |
| | Phase | Three Phase | | | Three Phase |
| | Rated Current (220 volts) | 58 amps | 75 amps | 94 amps | 120 |
| | Idle Current | 9 amps | 11 amps | 13 amps | 13 |
| | Power Factor @ Rated Load | 74% | 76% | 75% | 74% |
| Weights (Approx.): | Net | 586 lb. | 675 lb. | 800 lb. | 910 lb. |
| | Domestic Shipping | 650 lb. | 739 lb. | 864 lb. | 974 lb. |
| | Export Shipping | 731 lb. | 820 lb. | 945 lb. | 1055 lb. |

| Dimensions (all types) | Height | Width | Depth |
|---|---|---|---|
| Machine, overall | 39⅞" | 26⅛" | 28½" |
| Export Crate | 55" | 36" | 36" |

*220/380 and other single voltages available on special order

## OPTIONAL FEATURES

(at slight additional cost)

**Undercarriage**—provides portability. A sturdy three-wheeled undercarriage with either steel (K-726) or solid rubber tires (K-726R) is available for field installation.

**Remote Current Control** — Changes machine current setting from the operator's station with a simple toggle switch. The switch operates a motor inside the welder case which rotates control crank to adjust current up or down. Available factory-installed only.

**ML-2 Power Pack**—provides 115 volt DC control power and other circuits necessary for Lincoln ML-2 Squirt Welder. Available as a kit for field installation.

**115 Volt Starter Circuit** — for plants with regulations requiring 115 volts on starter push button circuits. Available factory-installed only.

**Accessory Kit** — includes headshield and lenses, electrode holder, ground clamp, and cables. Priced below total price of individual components.

**Remote Polarity Control** — Change from DC (+) to DC (—) or vice versa, with a switch attached to the electrode holder or mounted at the operator's station.

**THE LINCOLN ELECTRIC COMPANY**
Cleveland 17, Ohio

*The World's Largest Manufacturer of Arc Welding Equipment and Electrodes.*

LINCOLN ...USA

*continued from page 16*

## New RWMA Bulletins

*No. 28: "Seam Welding Galvanized Steel"*
*No. 29: "Tiplife Studies in the Spot Welding of 5052 Aluminum Alloy"*
*No. 30: "Effect of Zinc Coatings on Resistance Seam Welding of Sheet Steel"*

These three bulletins are published by the Resistance Welder Manufacturers' Association, 1900 Arch Street, Philadelphia 3, Penna. They are reprints of articles published by the Welding Research Council. Price is $.50 each.

## Metallizing Symbols

*"American Standard Metallizing Symbols, Y32.12-1960," American Standards Association, 10 East 40th St., New York 16, N. Y., or American Society of Mechanical Engineers, 29 West 39th St., New York 18, N .Y., $1.00.*

This standard is divided into four main sections: basic symbols, surface preparation symbols, supplementary symbols, and applications.

The standard is based on symbols used in this country and Canada. It was developed by a task group of the American Welding Society for the ASA Committee on Graphical Symbols and Designations, Y32, under the co-sponsorship of the American Institute of Electrical Engineers and the American Society of Mechanical Engineers.

### COMING EVENTS

**December 1-2:** Southwestern Zone Meeting, N.W.S.A., Hotel Roosevelt, New Orleans.

**January 23-26, 1961:** Plant Maintenance & Engineering Show, International Amphitheatre, Chicago.

**February 1-2, 1961:** 7th Midwest Welding Conference, Armour Research Foundation, Illinois Institute of Technology, Chicago.

**March 20-24, 1961:** 12th Western Metal Congress and Exposition, Pan-Pacific Auditorium, Los Angeles.

**March 24-25, 1961:** Kansas Welding Show, Wichita Section, A.W.S. Wichita, Kansas.

**April 17-21, 1961:** American Welding Society Convention and Welding Exposition, Sheraton-Atlantic Hotel and New York Coliseum, New York City.

**April 25-26, 1961:** International Acetylene Convention, Pittsburgh.

**May 8-10, 1961:** National Welding Supply Association Convention, New York City.

For More Information Circle No. 67 on Reader Service Card.

Warehouse stocks in all important cities and towns.

SHAWINIGAN

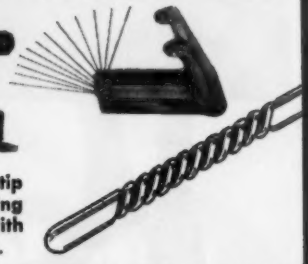
Shawinigan PRODUCTS CORPORATION
EMPIRE STATE BLDG., NEW YORK 1, NEW YORK
PLANTS: Keokuk, Iowa; Pryor, Oklahoma; and Shawinigan Falls, Quebec, Canada

Ray Thompson says...

"Thermo Tip Cleaners are the safest and best cleaners I have ever used. The non-breakable spiral design eliminates the hazard of breaking a cleaner in a cutting tip.

"The Thermo spiral does a better job of working out the carbon and slag without damaging the inside wall. The precision tolerance keeps the tip orifice to true size, giving a straight flame."

Ray Thompson is a recognized expert, repairing thousands of cutting tips each year. He is employed by the Pacific Tip Co. of Los Angeles, Calif.



Use Thermo Tip Cleaners and cut your tip repair costs, at the same time increasing your cutting efficiency. The only cleaner with a non-breakable money-back guarantee.

Send for a free sample today and find out for yourself why Thermo Tip Cleaners are better.

All progressive welding supply dealers stock Thermo Tip Cleaners.

THERMACOTE Company
108 SOUTH DE LACEY AVENUE • PASADENA, CALIFORNIA

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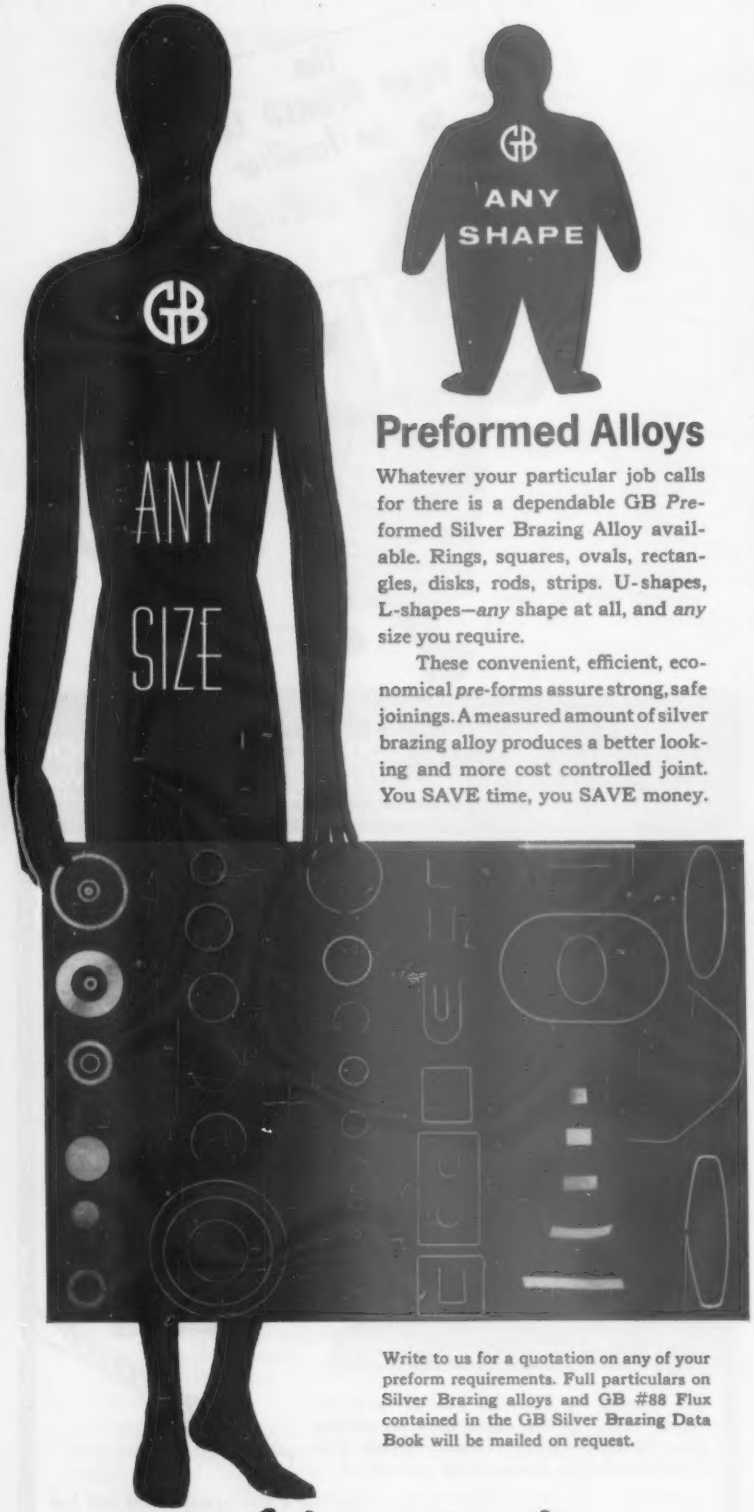
← Circle No. 46 on Reader Service Card.




## Preformed Alloys

Whatever your particular job calls for there is a dependable GB *Pre*-formed Silver Brazing Alloy available. Rings, squares, ovals, rectangles, disks, rods, strips. U-shapes, L-shapes—*any* shape at all, and *any* size you require.

These convenient, efficient, economical *pre*-forms assure strong, safe joinings. A measured amount of silver brazing alloy produces a better looking and more cost controlled joint. You SAVE time, you SAVE money.

Write to us for a quotation on any of your preform requirements. Full particulars on Silver Brazing alloys and GB #88 Flux contained in the GB Silver Brazing Data Book will be mailed on request.

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DIVISION OF NATIONAL LEAD CO.
900 WEST 18th STREET • CHICAGO 8, ILLINOIS
For More Information Circle No. 34 on Reader Service Card.


# MEN ON THE MOVE

*in the welding industry*

## APPOINTMENTS:

LYLE

PEPLER

**W. C. Lyle, Jr.** is district sales manager in Ohio, eastern Kentucky, West Virginia, and western Pennsylvania for Stulz-Sickles Co., Elizabeth, N. J.

Fibre-Metal Products Co., Chester, Pa. has named **Deric B. Pepler** general manager of its new Southeastern Warehouse in Decatur, Georgia. **Joseph J. Hauser** is on Mr. Pepler's sales staff.

**Richard E. Miller** will supervise sales of the Sightgard line of eye and face protection equipment made by Mine Safety Appliances Co., Pittsburgh.

**Stanley R. Burleson** has been appointed an application engineer by the Wall Colmonoy Corp., Detroit. He will work out of Oklahoma City.

**Dr. J. T. Hugill** heads Air Reduction Sales Company's on-site operations and tonnage products sales department. He had been manager of field operations and construction for Air Liquide of Canada.

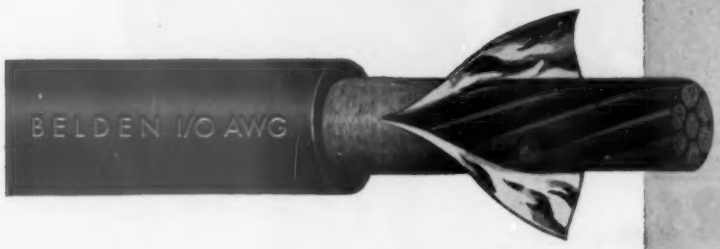
**George I. Cohen** is a new sales representative for the Goodrich Welding Equipment Corp., Hudsonville, Michigan. He will cover New England and the eastern seaboard states.

**Eugene F. Klumb** was named district sales manager in Chicago for the Controls Section, Budd Company, Philadelphia. The company also appointed **Richard E. Love** marketing manager of its Instruments Division, Phoenixville, Pa.

*continued on page* 25

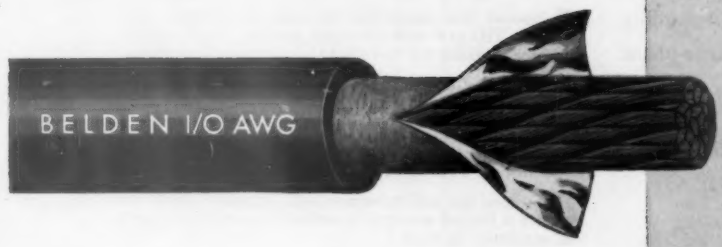
# Belden Welding Cable
## the Complete Line

**O.T.R. Rubber-Jacketed Cables**
Oil-tempered rubber gives the best balance between easy handling, flexibility, and resistance to the effects of oil, heat, cold, and mechanical abuse.




**Neoprene-Jacketed Cables**
Resist oil, grease, heat, sunlight, mechanical abuse, and ozone set up by high frequency welding or atmospheric conditions.

**HVF Vinyl Plastic-Jacketed Cables**
High voltage-frequency vinyl insulation affords perfect resistance to corona and ozone cracking . . makes this cable ideal for high frequency welding. High resistance to abrasion, oil, and impact.




**Whip Lead Cables**
Hawser lay construction of conductor makes this cable extremely limp and manageable . . minimizes operator fatigue. Jacket won't pull away from electrode holder. Neoprene insulation.

**plus rubber-jacketed welder power supply cords**

*ask your welding supply distributor*

**one wire source for everything electrical and electronic**

magnet wire • lead wire • power supply cords • cord sets • portable cordage • electronic wire • automotive replacement wire and cable • aircraft wire • electrical household replacement cords

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WIREMAKER FOR INDUSTRY
SINCE 1902
CHICAGO

58-1-9

NOW . . . For the First Time in the Industry!

# 3-PHASE INPUT

AC-DC Arc Welding

with the new

## VICKERS® Controlarc®

This latest addition to the Vickers Controlarc line offers something new in welding—combining the advantages of three-phase rectifier type welders with AC-DC output, both in one outstanding machine. Controlarc circuits utilize three-phase power to provide *both* the AC and DC outputs. And there are many other benefits to be found in this new welding machine from Vickers.

**FOR COMPLETE DETAILS, WRITE FOR NEW BULLETIN 7206-3**
*Some Territories Open to Qualified Dealers. Write Today.*

- Excellent AC performance *and* same high quality DC performance, through duplicate circuitry of existing three-phase Controlarc
- Wide output range—6 to 400 amperes DC, 6 to 250 amperes AC in this Controlarc 330 (300 ampere unit)
- Full single range operation on AC and DC permits use of standard Vickers slope controller without limitation due to range switches
- Special low range AC for high performance low current TIG and stick electrode welding. (Low current resistor available for test lab and experimental welding.)
- Dual continuous control on both AC and DC. Arc control provides adjustable arc characteristics (curve slope and response speed) on both AC and DC
- Selective arc starting circuitry (with on-off switch) operates on both AC and DC. Standard on all designs
- Built-in gas and water controls; high-frequency arc starter is located external to welder to permit placement in proximity to work
- Standard Vickers *foot* control units and *dual remote* hand control units adjust both AC and DC output currents.

**VICKERS INCORPORATED**
Division of SPERRY-RAND Corporation

**ELECTRIC PRODUCTS DIVISION**

1855 LOCUST STREET
SAINT LOUIS 3, MISSOURI

EPA 7300-1

For More Information Circle No. 77 on Reader Service Card.

## MEN ON THE MOVE

*continued from page 22*

### APPOINTMENTS:

The Lincoln Electric Co. has appointed two new field engineers: **James T. Hart** in Memphis and **Richard K. Lore** in Atlanta. **Richard C. Pierce** was transferred from Savannah to Mobile.

Norton Company, Worcester, Mass., has announced these appointments: **John J. Amero** is in charge of the vitrified bond unit in the Research and Development Department. **Frank W. Nowell,** formerly abrasive engineer in the upper New York State area, has been transferred to a similar post in Chicago. He is succeeded by **George P. Higgins, Jr.,** from Teterboro, New Jersey.

### PROMOTIONS:

BOUCHER

BLODGETT

**A. F. Boucher** is assistant general sales manager for The Lincoln Electric Company, Cleveland. Boucher was formerly district manager at Detroit.

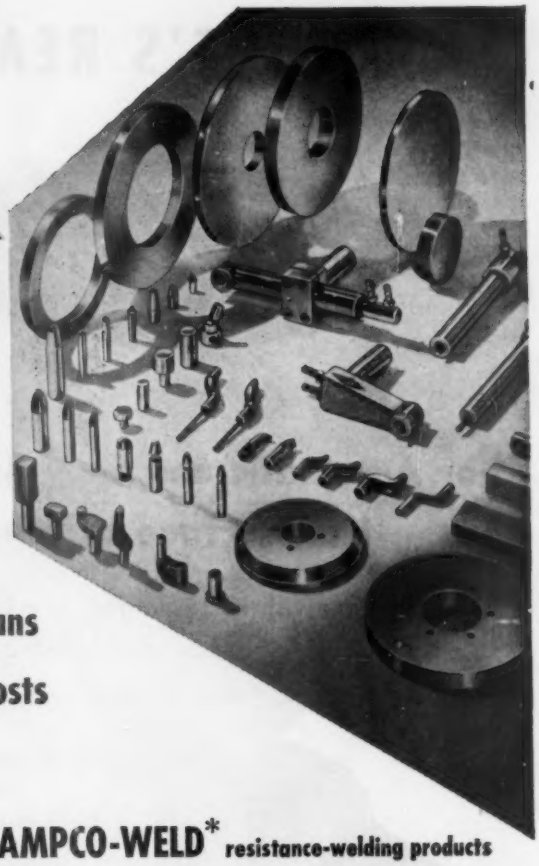
**F. L. Blodgett** is general manager of the Hard Surfacing Division of Alloy Rods Company, York, Penna. He had been general sales manager for the company.

**George E. Saranac** is the new advertising manager at Eutectic Welding Alloys Corp., Flushing, New York. **Ernest J. Florestano** is Eutectic's district manager in Virginia's maritime area.

**John W. Eder, Jr.,** has been appointed general sales manager of Chicago Eye Shield Co., Chicago. He had been assistant sales manager.

*continued on page 26*


**You've Got What It Takes**



**for longer runs and lower costs**

**...when you use AMPCO-WELD* resistance-welding products**

Every item in the complete Ampco-Weld line is manufactured under strict laboratory control to give you longer runs and lower costs.

**AMPCO-WELD spot-welding tips** — stay cooler — won't stick to the work . . . tough — resist mushrooming and wear . . . fewer dressings needed — they last longer, cost less.

**AMPCO-WELD rod** — is available from stock — either in rounds, including hex, or in square and rectangular bars. There's a size for every need — all feature Ampco toughness and high electrical conductivity.

**AMPCO-WELD seam-welding wheels** — many users report 150% longer life. Resist wear — even at elevated temperatures. High electrical conductivity. Get them on short notice as rough forgings, finished blanks, or fully machined.

**AMPCO-WELD resistance-welding holders** — to suit every job — straight, offset, and universal ejector models. Offset and universal holders have interchangeable sockets for No. 1 and No. 2 Morse tapers. You change tapers without changing holders.

All Ampco-Weld resistance-welding products meet or exceed RWMA specifications. Experienced engineering service is also available. Get what it takes to lower your resistance-welding costs — get Ampco-Weld, the best value for your resistance-welding dollar.

RW-18

AMPCO

*Sole producer of genuine Ampco Metal*

**AMPCO METAL, INC.**

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**For More Information Circle No. 8 on Reader Service Card.**

# NOW IT'S READY!

*New* **Ranomatic** *Wire*

## For Automatic and Semi-Automatic Hardsurface Welding

RANITE manual rod quality now available in tubular coil wire for automatic and semi-automatic hardsurface welding

★ *Continuous operation*

★ *High efficiency*

★ *Broad adaptability*

★ *Minimum labor*

★ *Fast application*

**RANOMATIC** will be sold through your local **RANITE** distributor. For detailed information and prices ask him for bulletin No. R101, or write direct to Rankin Manufacturing Company.

**RANKIN MANUFACTURING COMPANY**

616 S. MARENGO AVE. P. O. BOX 631 ALHAMBRA, CALIF.

**For More Information Circle No. 64 on Reader Service Card.**


## MEN ON THE MOVE

*continued from page 25*

### PROMOTIONS:

RIDER

TUTHILL

Bastian-Blessing Company, Chicago, has named **Alfred T. Rider** district sales manager for Missouri, eastern Kansas, central and southern Illinois, and western Tennessee.

Air Reduction Sales Co. has announced several promotions: **Roger W. Tuthill** is manager of engineering for Airco's Special Products Department.

**D. F. Bovie** is assistant manager of engineering services in Pittsburgh.

**C. J. Langley** is assistant district manager in Philadelphia.

Amperex Electronics Corp., Hicksville, N. Y., promoted **Tom O'Connor** to distributor sales specialist.

### ANNIVERSARY:

**Albert E. Hackett,** (right) sales engineer for Progressive Welder and Machine Co., Pontiac, Mich., is honored on completing 50 years in the resistance welding field. **Ray Heiden,** Progressive's president, makes the award.

### DEATHS:

**Edgar N. Luckey,** former director of sales of Welsh Mfg. Co., Providence, died suddenly while attending the 1960 National Safety Congress in Chicago. He was 69.

VICTOR

# New gaugeless regulators

**Available in VGS Single-Stage or VGT Two-Stage Models**

*1. Delivery pressure adjustment*
- —Simple and easy to adjust
- —Readable on two sides
- —Bold pressure readings stamped in cap
- —Bright, easy-to-read pressure indicator

*2. Inlet pressure indicator*
- —Enclosed and protected piston-type
- —Clearly marked Full to Empty scale stamped permanently into metal
- —Reliable 'O' Ring Seal

*3. Listed under Reexamination Service of Underwriters' Laboratories, Inc.*

The VGS400 series single-stage and VGT400 series two-stage regulators embody all of the time-tested and field-proved design characteristics that have made VICTOR Safety Regulators the choice of the man on the job. The use of pressure indicators instead of pressure gauges provides increased service for hard usage applications. Order from your Victor dealer.

| Single-Stage Models | | Two-stage Models | |
|---|---|---|---|
| VGS430-967 | 0-100 psig | VGT430-967 | 0-100 psig |
| VGS410-970 | 0-15 psig | VGT410-970 | 0-15 psig |

72

VICTOR for regulators

**VICTOR EQUIPMENT COMPANY** *San Francisco, California*
*Los Angeles, California, Chicago, Illinois*

MFRS. OF HIGH PRESSURE AND LARGE VOLUME GAS REGULATORS; WELDING & CUTTING EQUIPMENT; HARDFACING RODS; BLASTING NOZZLES; COBALT & TUNGSTEN CASTINGS; STRAIGHT-LINE AND SHAPE CUTTING MACHINES; ROLLER AND IDLER REBUILDING MACHINES

**For More Information Circle No. 78 on Reader Service Card.**

# Metal sculpture: New market for welding supply distributors

MINNEAPOLIS: A modern 13-ton welded scroll stands outside the city's new public library. The scroll is 27-feet high, has an arc welded steel framework covered with 50 sheets of copper, each 3 by 9 feet. The sculptor hammered designs into the plates, then overlayed them with a silicon-bronze alloy.

The sculptor is John Rood, professor of art at the University of Minnesota. He began working with metal in 1953.

"Rood uses enough oxygen, acetylene, and welding rod to rank with the industrial accounts we serve," says Phil Cohen of Northern Welders, Inc., Minneapolis. They distribute welding equipment for National Cylinder Gas Division of Chemetron Corporation.

Cohen sells arc and gas welding equipment and supplies to most of the city's welding sculptors. He estimates 800 University of Minnesota and Minneapolis School of Art students have learned to do it. They use various techniques. Some weld specially cut steel and copper sheets for unusual effects. They often use welding rods as part of their sculptures.

Others, such as Rood, lean more toward flame shaping than fabrication. Rood usually covers metal forms with molten weld metal. He models the piece with flame as clay is shaped with the fingers. He works with steel, copper, brass, bronze, stainless steel, and aluminum. He says, "By welding, I can make shapes that would be almost impossible to make any other way."

V. L. Sage, NCG district manager in Minneapolis, says, "Welding sculpture has grown for two reasons. It gives the sculptor a completely new material, and it's fun. Most beginners use gas equipment because it is cheaper, needs no special power source. They can equip themselves for less than $150. For that they can get a welding torch with four tips, cutting attachment and cutting tip, tip mixer, oxygen and acetylene regulators, hose, goggles, lighter, and wrenches. Gas costs only about $10 a month. They use mild steel, high strength steel, bronze, silicon bronze, and nickel bronze welding rods. Some artists use arc welders for making frameworks of larger pieces."

**ARC WELDED FRAMEWORK** of 13-ton scroll will be covered with 50 sheets of copper.

**"BIRDS IN FLIGHT"** is a good example of welded metal sculpture created by John Rood.

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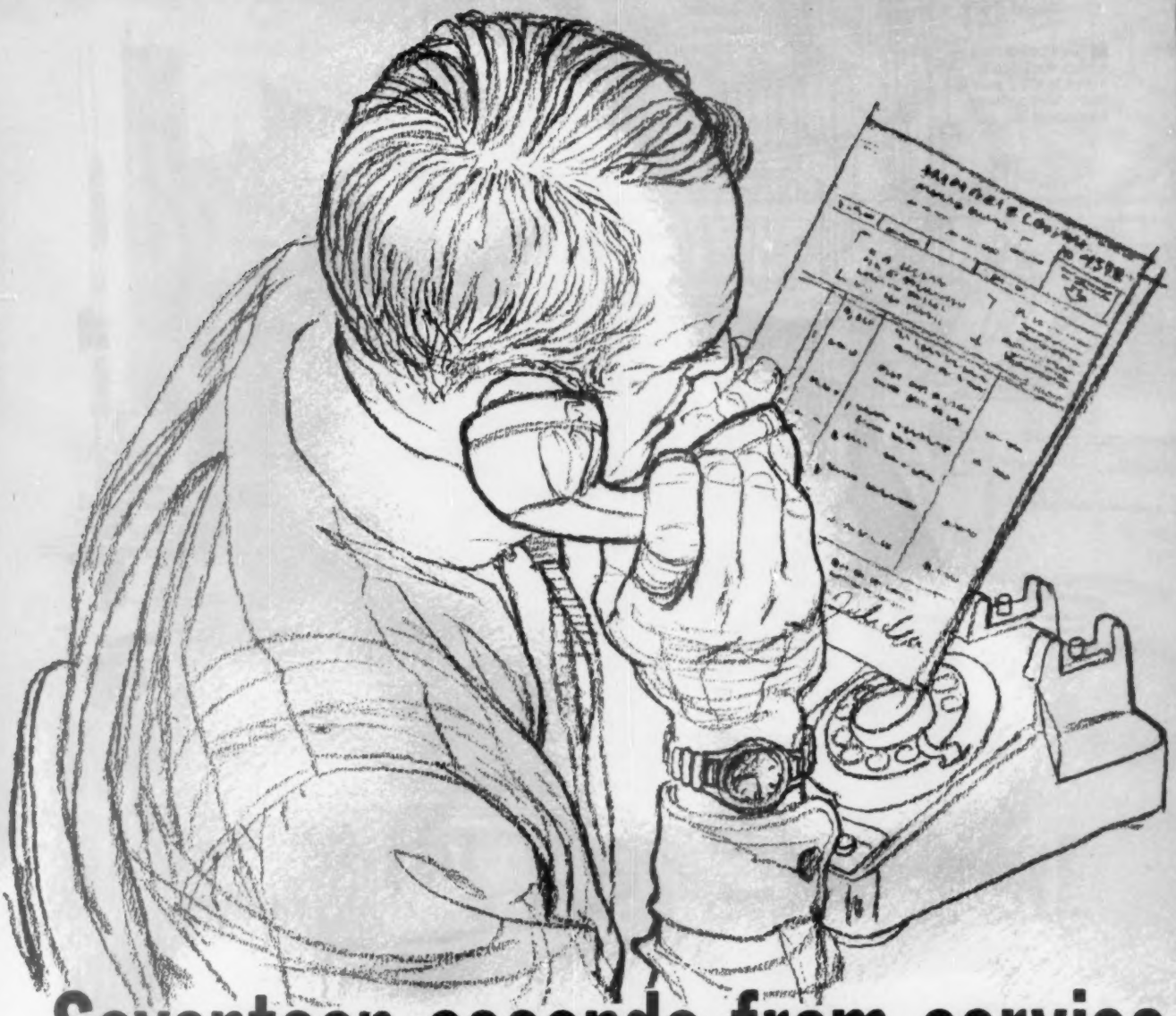

# Seventeen seconds from service

Whatever the job . . . welding, cutting, brazing, or metal conditioning . . . you are only seventeen seconds from service when you call your nearby NCG dealer. Stocked with a complete line of NCG industrial gases, arc welders, electrodes, torches and rods, and related accessories; your NCG dealer provides prompt delivery of the equipment and materials needed to keep your production timetable on schedule.

Equally important, you profit from the broad experience and know-how of NCG when you call your NCG dealer. He knows the business and can ably assist your organization in getting the job done right without false starts or costly mistakes and delays.

For prompt supply, expert service, and guaranteed satisfaction; look in the Yellow Pages under "Welding" and call your NCG dealer.

NCG®

**NATIONAL CYLINDER GAS**

**DIVISION OF CHEMETRON CORPORATION**

840 N. Michigan Ave. Dept. E-3N
Chicago 11, Illinois

CHEMETRON

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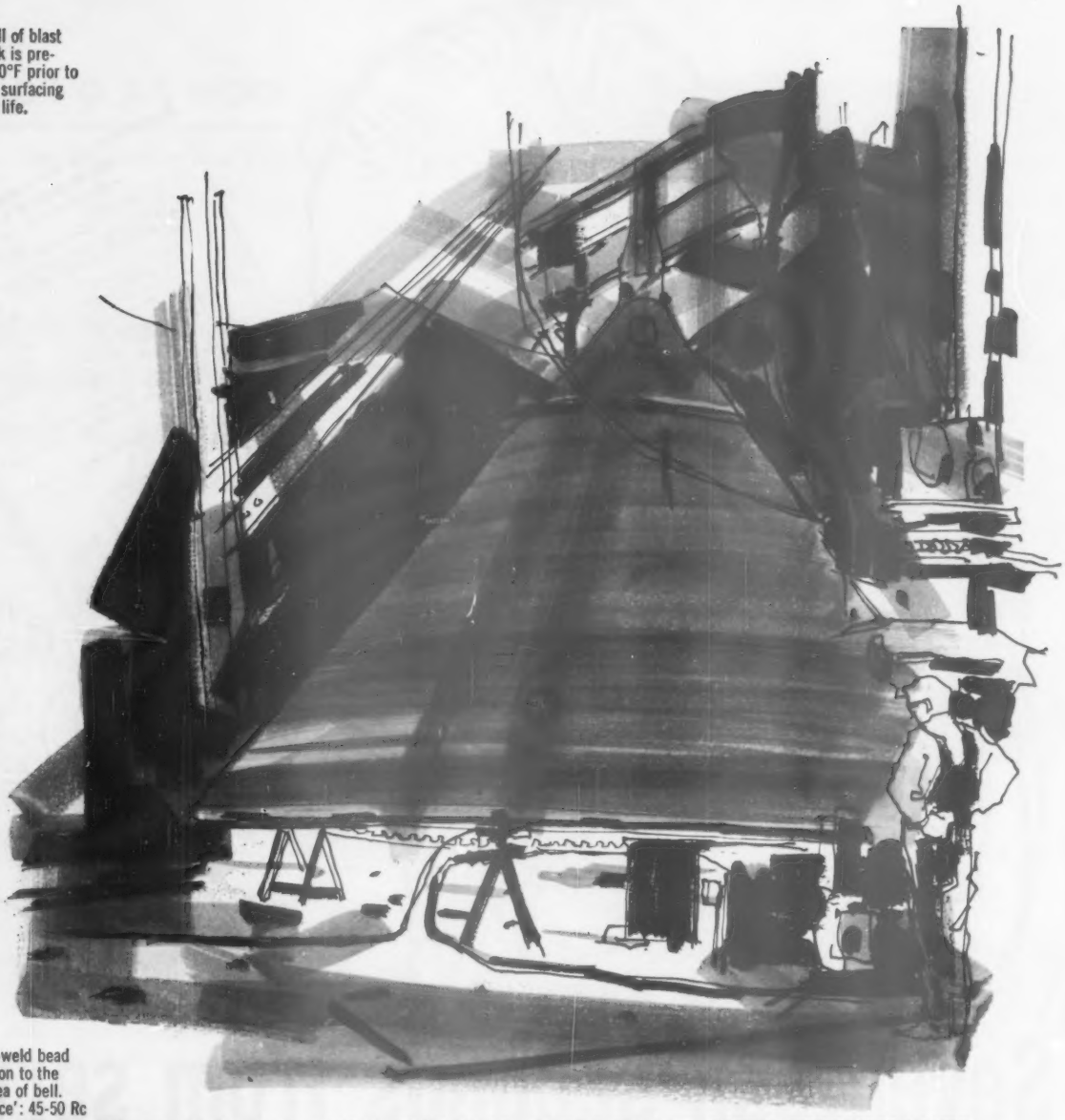
■ Giant bell of blast furnace stack is pre-heated to 400°F prior to Mahon hard surfacing for renewed life.



■ A hard-weld bead is spiraled on to the working area of bell. 'New Surface': 45-50 Rc

MEN WHO KNOW FACILITIES, CAPACITY AND **NEW TECHNIQUES . . .**
BUY **"fabrication by Mahon"**

Mahon's Steel-Weld Division constantly strives for better fabrication techniques—solidly developed out of long experience combined with broad-range facilities and wide-breadth capacity. *Example: new hard-coat (to 45-50 Rc) resurfacing* of worn steel parts for extended useful life. The Mahon method involves special submerged-arc welding, vertical milling and finish grinding. It is as applicable to high-wear new parts as it is to reconditioning older pieces. Why not look into how Mahon 'hard-surfacing' can be profitably used in the products you make or the equipment you use? We suggest you write to Mr. J. W. Ault, Manager of Mahon's Steel-Weld Division.

THE R. C. MAHON COMPANY • DETROIT 34, MICHIGAN

Manufacturing Plants—Detroit and Torrance, Calif.
Sales-Engineering Offices: Detroit, Chicago, New York, San Francisco and Torrance

# MAHON

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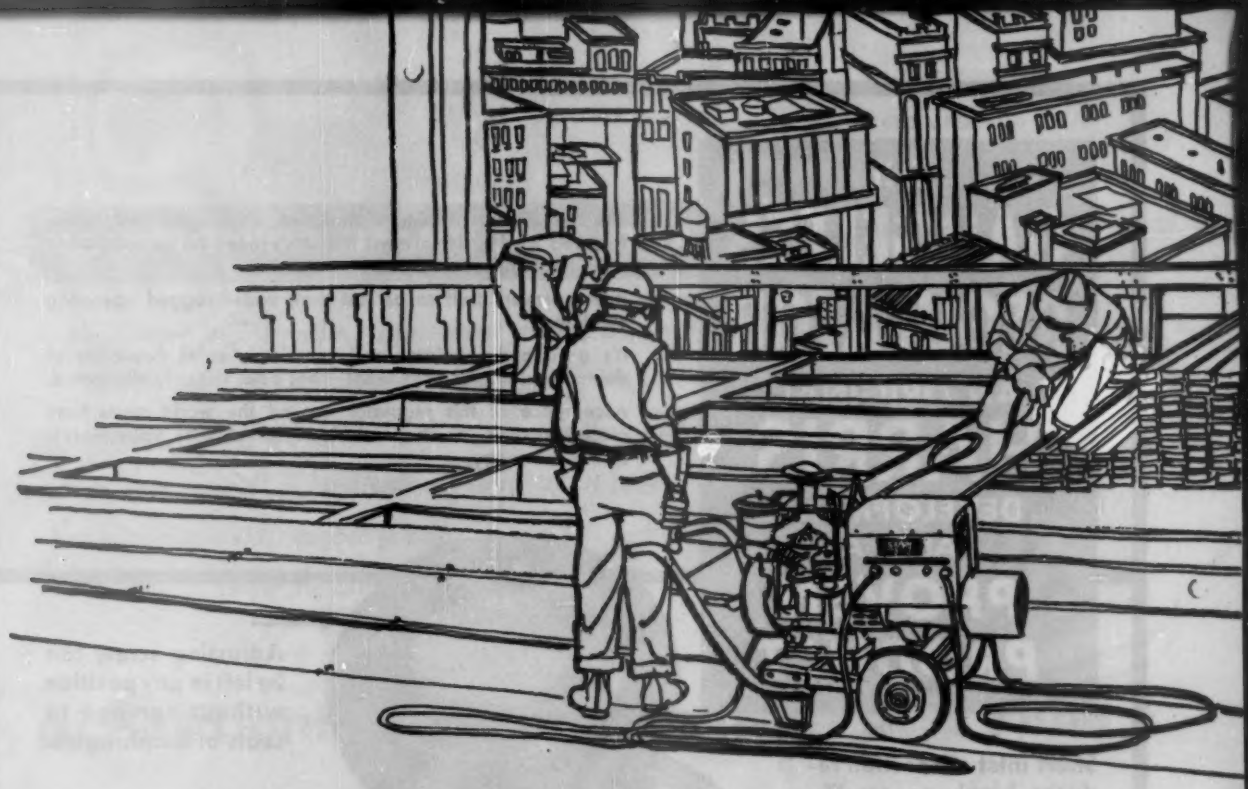
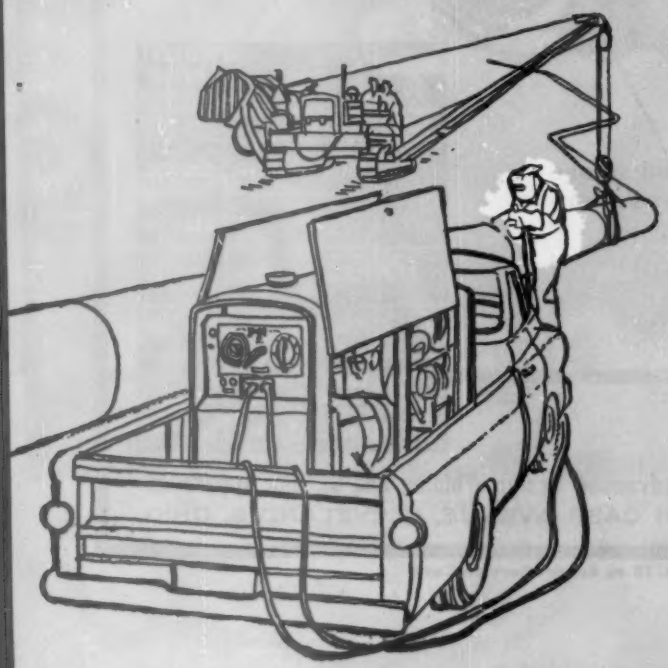


# WELD 50 STORIES UP...
# OR 50 MILES FROM NOWHERE
## with P&H Engine-Driven Welders



You can use these portable, self-contained welders to save time and work on any construction job *anywhere!* They are ideal for buildings, pipe lines, bridges, or maintenance — wherever you need cost-cutting weld-power to join and strengthen metal parts and sections. You simply haul, wheel, or hoist the welders into position and start welding.

P&H offers you six machines for welding requirements ranging from 25 to 500 amps. Easy, precise voltage control and arc stability enable operators to lay down sounder, cleaner welds faster — prevent burn-through and popouts, thus sparing you the need for costly rewelds and call-backs.

You don't have to pamper P&H welders. They're built to withstand hard use and rough handling in the field. They need less care — and they are easier to service. Rugged field-proved gas or diesel engines meet your toughest demands with power and fuel to spare.

You can choose skid- or wheel-mounted machines — with manual or electric starting. Interested? Write for Bulletin W-158.

P&H **HARNISCHFEGER**
WELDERS • ELECTRODES • POSITIONERS
MILWAUKEE 46, WISCONSIN

Export Division:
4320 W. National Ave., Milwaukee, Wis.

P&H welding equipment is manufactured and sold in Canada by REGENT EQUIPMENT MANUFACTURING CO., LTD., 485 King St. West • Toronto, Ontario, Canada.

# THE GAUGELESS REGULATOR

AN ORIGINAL **HARRIS** DEVELOPMENT AND A ***PROVEN PRODUCT***

The No. 77 was originally designed, developed and manufactured by Harris to meet industry's need for a completely new, damage-proof gaugeless regulator.

It has proven itself to be just that, under rugged operating conditions.

It's a rugged regulator and completely safe! Possibility of damage — internal or external — has been virtually eliminated.

Acceptance of this regulator around the world stems from many reasons, as shown below. Check with your Harris distributor today.

Adjusting screw can be left in any position without damage to seats or diaphragms.

Thimble protects adjusting screw threads and shows pressure adjustments.

Easily read working pressure indicator replaces low pressure gauge.

Approved by underwriters laboratories.

Short inlet connection reduces breakage, readily removed for replacement.

Nut supported over inlet stem to prevent damage to stem seat.

High pressure cylinder content indicator, indicates ¼, ½, ¾ and full. Replaces high pressure gauge.

First and second stage safety valves.

| MODEL NO. | TYPE | DELIVERY RANGE POUNDS |
|---|---|---|
| X-77 | Oxygen | 0 to 200 |
| 77 | Oxygen | 0 to 100 |
| 77-A | Oxygen | 0 to 50 |
| 77-P | P.O.L. Acetylene | 0 to 15 |
| X-77-P | P.O.L. Propane | 0 to 50 |
| 77-D | Coml. Acetylene | 0 to 15 |
| X-77-D | Coml. Propane | 0 to 50 |

3114-HC

HARRIS

**Building World-wide Customer Confidence with Advanced Design Welding and Cutting Apparatus**

THE HARRIS CALORIFIC COMPANY, 5501 CASS AVENUE, CLEVELAND 2, OHIO

For More Information Circle No. 38 on Reader Service Card.

Welding Design & Fabrication

**POSITIONING/HANDLING IDEAS**

*A positioning and handling equipment dollar, wisely spent isn't gone with the flavor, like one spent for a box of candy. It starts paying dividends as soon as the equipment it buys goes to work. The dividends show up in faster-made, better quality welds; higher production and less equipment tie-ups; fewer rejections, and fewer accidents.*

# a/ Positioning: Better Welds In Less Time

IT COSTS LESS to weld downhand than any other way. That's because, when you position for downhand welding, you weld faster and better. And, if you switch from manual to semiautomatic welding, costs drop more. For top speed, quality, and uniformity, automatic welding is the thing.

**KEY** to blast furnace bell hardfacing is an immense, but accurately turning positioner, and automatic welding.

Positioner manufacturers can tell you where to use positioners and where not to. They also can tell you how to position efficiently to save the most. Here's what Willard Gunzelman, World Electric Company, says: "Labor and overhead comprise 86 percent of job shop production welding costs. The fabricator often forgets that his profits depend on houly production. By positioning his work, the increased production will pay for the positioner in a year.

### FILLET SIZE AND ELECTRODES REGULATE SAVINGS

"You don't save much by positioning a ¼-inch fillet," continued Gunzelman, "but you do with larger fillets. And the electrode you use affects savings, too. A nonpositioned, ⅜-inch fillet made with a ¼-inch E6012 electrode costs about $0.526 a foot.

Positioning helps companies of all sizes. The Benthol Machine Co., a small one in Suffolk, Virginia, used to make a machine chassis without positioning. It took them 33 hours. With positioning, they do the job in only 8 hours. They hold the chassis between a Harnischfeger positioner and tailstock while they weld. And they use the positioner on other work when the chassis job isn't running.

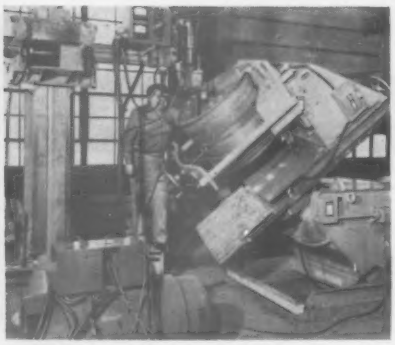
### THE MORE WELDING IN ONE SETUP, THE BETTER

Sometimes, an extra-capacity positioner saves work. Jeffrey Mfg. Co., Columbus, positioned a 10,000 lb. weldment on a 16,000 lb. Harnischfeger unit. By bolting the narrow part of the 6-foot square, 2-foot thick chassis to the positioner, 90 percent of the job is open to welding—on one positioner setup.

For high production, you've got to position for

*continued on next page*

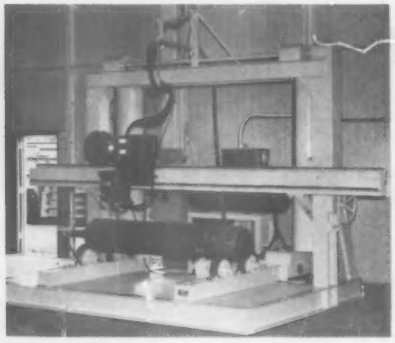
**LACK HEADROOM?** Putting positioner in a hole raises the ceiling several feet.



**HEADSTOCK** on positioner permits one setup, 2-side welding of this truckwheel.

**HEADS UP** welding is assured on this Unique welding positioner.

**A TOUGH WELDING JOB** is made easy with a fixture, a positioner, and a automatic.



**TURNING ROLLS** and automatic welding are unbeatable for quality production.

**SMALL WELDMENT,** small positioner (Ransome) is most efficient.

automatic welding. The Lufkin Foundry, Lufkin, Texas, couldn't make hydraulic bottles fast enough with hand welding and turning. By switching to automatic welding and power rotation they turned out the 10- to 24-inch bottles, three times faster than by hand. They used Ransome turning rolls (variable-speed driven and idler sets) and a side beam welding head support. The welds had fewer defects, looked better.

Does a welding plant need costly special equipment to do high production welding? A heavy truckmaker didn't, they bought standard equipment and got all the production they needed. They make 22- to 40-inch steel wheels that weigh from 400 to 1,000 lb. They didn't want a specialized setup that would be obsolete if the design changed.

### WELD BOTH SIDES WITH ONE SETUP

They mounted a 2,500 lb. Aronson headstock on a 6,000 lb. Aronson gear-driven positioner. Then they attached a wheel-holding fixture to the headstock face-plate. They wired a Herrick welding head manipulator to the other units for synchronized operation. Limit switches stopped headstock rotation at 180 degrees and set the table at 45 degree tilt.

After they fillet-welded the wheel one end with submerged arc, the headstock turned it end-for-end. This meant that they made the second fillet without another setup. Another advantage: the company can double production by adding another positioning package like the first and using the welding head manipulator they have for both setups.

Companies can save a lot by automatic welding big jobs. For instance, a big steel mill reclaims 17-foot diameter, 35-ton blast furnace bells and hoppers —for half the cost of new ones. Manual welding is too slow and too costly. Also, hand welds aren't uniform and they usually crack between passes. Cracks make the bells and hoppers wear faster.

### HEAVY WELDMENTS, HIGH QUALITY

A large mill eliminated bead cracking by positioning for automatic welding. They used a 50-ton Aronson positioner (at 78″ CG) and a welding head manipulator. This gave them close control of preheat and bead contour through days of continuous welding. And with the extra load capacity of the big positioner (25 percent), the mill will be able to reclaim even larger bells and hoppers.

The positioner turns at all speeds necessary to weld the various bell diameters (3 to 48 ipm). With automatic welding, the deposit rate was 16.8 lb. per are-hour. The manual welding rate was only 3 lb. per hour. Other advantages of positioned welding: bells and hoppers are tied up only a fraction of hand welding time, and preheat-gas costs are lower because welding is faster.

# b/Jib Cranes Lift Production, Lower Costs

JIB CRANES AND HOISTS are economical, all-purpose handling combinations that are ideal for metal fabricating plants. They make welding, flamecutting, shearing, forming, punching, sawing, and machining self-sufficient. They lift and move materials and assemblies in an area as big as 1,500 sq. ft.—a big-enough reach to service several machines, like welding positioners, shears, or flamecutters.

In big plants, jib cranes relieve overhead cranes. They release the big fellows for long, heavy lifts and save production people and equipment from unproductive waits.

Little plants aren't usually in the overhead-crane class. But they can still do good-sized jobs with a small investment in a jib crane.

**Jib cranes,** commonly used in fabricating plants, are made in ¼- to 6-ton capacities, with booms that reach 8 to 20 feet. There are three basic types: bracket (they swing in a half-circle arc), mast (half-circle or full-circle swing), and pillar (half- or full-circle swing). There are two kinds of pillar jib cranes: the pedestal model which bolts to the floor, and the foundation model which is set in concrete.

All three types have variations designed to gain certain advantages: maximum lift, added strength, and extra stability. (See sketches). There's a fourth type of jib crane called a travelling wall crane. This crane can roll as far as its top and bottom tracks will allow.

**There are hoists** that will lift almost anything. But for jib cranes, hoists are usually selected in the ¼- to 6-ton capacities—just like the cranes. Hoists are powered by air cylinder, air motor, electric motor, and hand. They come in a variety of models that meet most space and speed requirements.

All hoists have one basic function: to move loads vertically. Beyond this, each hoist must do a specific job. You have to consider every factor that will affect a hoist's performance before you buy one.

Like other equipment, the cost of a hoist is only

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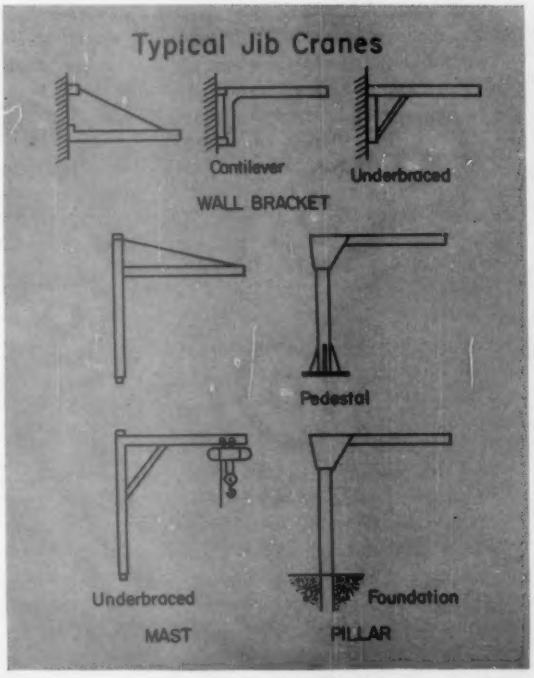
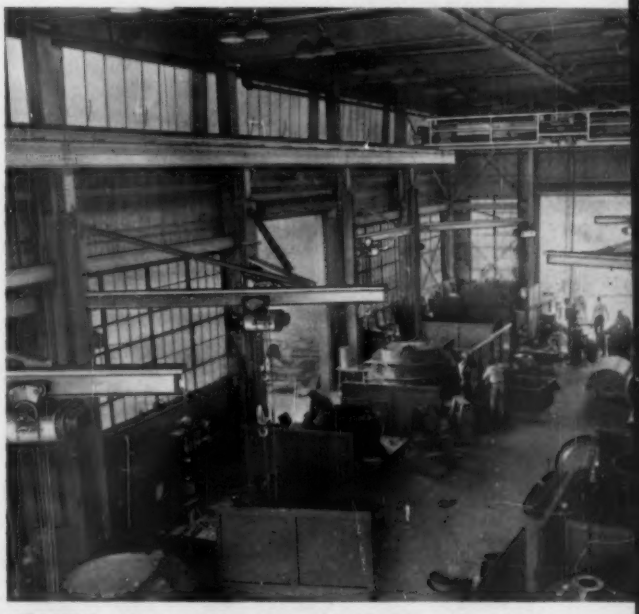
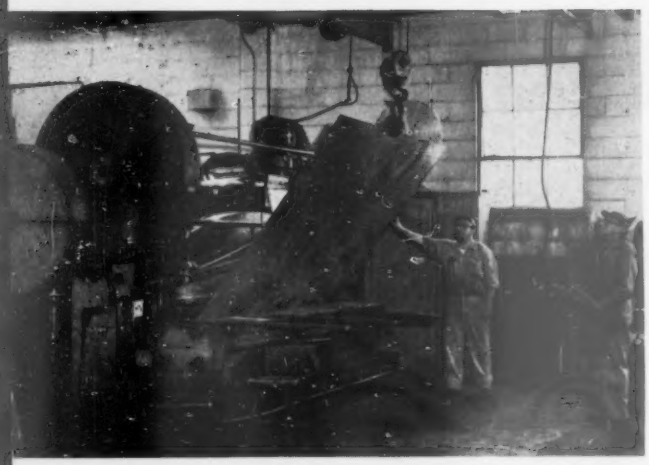


**WELDING.** Mast-type jib cranes with Manning, Maxwell & Moore's electric hoists service each welding station, prevent costly waits.



**LIFTING CLAMPS,** like this self-locking Merrill Bros. model, save handling time in plate bending and shearing.

## WHERE TO BUY SLINGS AND CLAMPS

| Manufacturer | Slings | | Plate Lifting Clamps |
|---|---|---|---|
| | Chain | Wire Rope | |
| American Chain & Cable Co., Inc. American Chain Division— | ● | | |
| Wire Rope Sling Department— | | ● | |
| American Steel and Wire Div., USS | | ● | |
| Bethlehem Steel Company | | ● | |
| Bux Mfg. Company | | | ● |
| Columbus McKinnon Chain Corp. | ● | | |
| Grand Specialties Company | ● | | ● |
| Jones & Laughlin Steel Corp. | ● | ● | |
| The McKay Company | ● | | |
| Merrill Brothers | ● | | ● |
| J. C. Renfroe & Sons, Inc. | | | ● |
| John A. Roebling's Sons Corp. | | ● | |
| Stryco Mfg. Company | ● | ● | |

## SAFE SLING LOADS, LBS.

| | Diameter or Size, Inches | | | |
|---|---|---|---|---|
| | | | 60° | 30° |
| Wire Rope (6x37 Improved Plow Steel) | 3/8 | 1,500 | 2,600 | 1,500 |
| | 1/2 | 3,000 | 5,000 | 3,000 |
| | 5/8 | 5,000 | 8,000 | 5,000 |
| | 3/4 | 7,000 | 12,000 | 7,000 |
| | 7/8 | 10,000 | 17,000 | 10,000 |
| Alloy Chains | 9/32 | 3,425 | 5,935 | 3,425 |
| | 5/16 | 5,500 | 9,525 | 5,500 |
| | 3/8 | 8,250 | 14,290 | 8,250 |
| Wrought Iron Chains | 3/8 | 2,700 | 4,700 | 2,700 |
| | 7/16 | 3,450 | 5,900 | 3,450 |
| | 1/2 | 4,500 | 7,800 | 4,500 |
| | 5/8 | 6,900 | 12,000 | 6,900 |
| | 3/4 | 10,100 | 17,500 | 10,100 |

## POSITIONING/HANDLING *continued*

part of its real cost to you. Operating cost, time saved (or lost) by its use, maintenance, are part of your investment. How much you get back depends on how well you follow these rules:

1. *Choose a hoist that will lift your heaviest load.*

Most important. Here's why: suppose you usually lift 3,000 lb. loads, and once-in-awhile, 5,000 lbs. You'll save a few dollars by buying a 3,000 lb. hoist, BUT you're overloading the hoist, making it breakdown prone. It's economically better to buy the 5,000 lb. capacity hoist. And when you figure hoist capacity, don't forget to add the weight of hoist attachments to the load.

2. *How much work will the hoist have to do?*

How many minutes per hour do you expect the hoist to run at full load? Hoist motors are usually 15-minute or 30-minute types. These represent the length of time a motor will run under full load without heating more than 55° C above room temperature.

If you have near-continuous operation with near-capacity load, you'll need a 30-minute motor to get efficiency and long life from your hoist.

The number of starts the hoist motor makes during regular operation has a lot to do with selecting a hoist. Because hoist motors have high starting torque, starts create more heat than running under full load.

The choice between an electric and a hand hoist depends on frequency of lifts. A rule-of-thumb: use an electric hoist if you have more than four lifts an hour. If you have less, use a hand hoist.

3. *How high will the hoist have to lift?*

Most manufacturers standardize on 8- to 10-foot-lifts for hand hoists, 10- to 12-foot for light-duty electric hoists, and over 18-foot lifts for heavy-duty hoists. The amount of lift you need depends on: jib-beam height, load dimensions, how much room slings or chains take, size of obstructions, hoist headroom, and how high the part must be raised.

4. *What hoisting speed do you need?*

Continuous, production-line hoisting generally requires a higher speed hoist than an intermittent application. You can get a single speed hoist powered by a squirrel-cage motor. Since this type starts at its top operating speed, fluid couplings or ballast resistance are sometimes added to smooth out the initial lift movement. Hoists with two or three fixed speeds are available with ratios of 2:1, 3:1, or 4:1, or combinations. With this type of hoist, each speed remains constant although the load weight might change.

5. *What kind of mounting will the hoist need?*

You can get a variety of mountings: hook, bolt, plain trolley, gear trolley, single-or variable-speed motor-driven trolley.

While these recommendations were written around electric and hand hoists, many of the tips apply equally-well to air-powered hoists. They're good too. Air hoists have infinite speed control and are usually more compact than the electrics.

***see page 39 for Jib Crane & Hoist buyer's guide***



**Circle No. 69 on Reader Service Card.**

# DO YOURSELF A GOOD TURN

See how A. O. Smith makes industry's only extra-heavy-duty welding machine

a view to value

**CAPACITORS** — Standard with A. O. Smith Extra-Heavy-Duty welders is the industry's maximum power factor correction — capacitors deliver 134 M.F.D. total. This high power factor means that the current taken from the primary line is lower than with any other machine when comparable ratings are matched. This more efficient use of primary power means more money saved through lower power bills.

**SHELL**—A. O. Smith Extra-Heavy-Duty welder is enclosed in an attractively designed, sturdy steel shell. Heavy-gauge steel throughout to withstand the roughest treatment. Frame and case retain "new" appearance throughout exceptionally long machine life. No danger here of being prematurely traded on the basis of looking "worn out." A machine that doesn't look its age lives longer.

**COILS** — A. O. Smith's extra-heavy copper coils are the heaviest in the field—primary and secondary coils together weigh 185 lbs. on a 500-amp machine with a rise of only 55°—lower than with any other on the market. In addition, coils have vacuum-impregnated silicone class "H" insulation — the highest temperature protection in use. Features which insure longer machine life.

**COOLING SYSTEM** — No other machine packs so much cooling power. Biggest fan in the field. Air is circulated by an 18-inch industrial-type fan — dynamically balanced and scientifically pitched to deliver maximum ventilation down through the coils. Power behind the fan is a big, totally enclosed, lifetime-lubricated motor providing more air for cooler operation and longer life.

**SWITCH**—Open-and-shut case for A. O. Smith superiority. A molded case switch controls primary power to this machine. All components are enclosed to prevent dam. breaker-type on-off switch contacts from damage and entrance of dirt and other foreign material. This is the most modern welding machine of its type in the industry. Value in the form of time-proved dependability. Switches used in most other welding machines. Vastly reduced maintenance cost.

**CORE**—Superior welding characteristics are insured through "U" core design. Because the adjustment is by magnetic field in air instead of iron, there is less electrical inertia. This results in a faster, more positive arc response. Better arc characteristics cut costs through reduced weld repair and improved, more efficient operator performance.

*To detach — just tear along dotted lines*

# ONLY A. O. SMITH LETS YOU PAY YOUR MONEY AND TAKE YOUR CHOICE!

*Through research* ... *a better way*

**A.O.Smith**
CORPORATION

**WELDING PRODUCTS DIVISION**
Milwaukee 1, Wisconsin
A. O. Smith INTERNATIONAL S.A.,
Milwaukee 1, Wis., U.S.A.

Why pay your money and take a chance? A. O. Smith lets you pay your money and take your choice — a **value** choice of both Extra-Heavy-Duty and Standard-Duty welding machines.

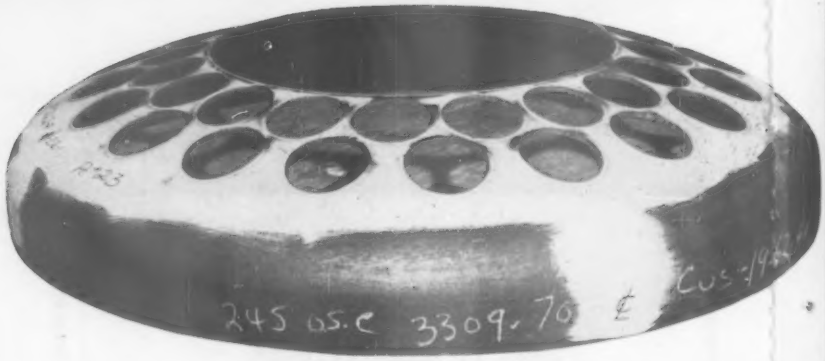
The value gauge on the front of this advertisement tells the inside story of A. O. Smith Extra-Heavy-Duty welders. It reveals that A. O. Smith is the only manufacturer that still builds a real Extra-Heavy-Duty welding machine — a welder designed and constructed with safety factors established 20 years ago for long life under the most severe operating conditions.

But, of course, for standard duty, A. O. Smith offers the MonArc shown at left. Here is industry's quality, low-cost welder. Available in 300, 400 and 500-amp models. More copper in the coils than any other competitive welder of the standard class, means this rugged welder will give you years of dependable operation. The MonArc is the picture of compactness. It racks! It stacks up to three high! It slides under a bench. Fits where others take up valuable floor space.

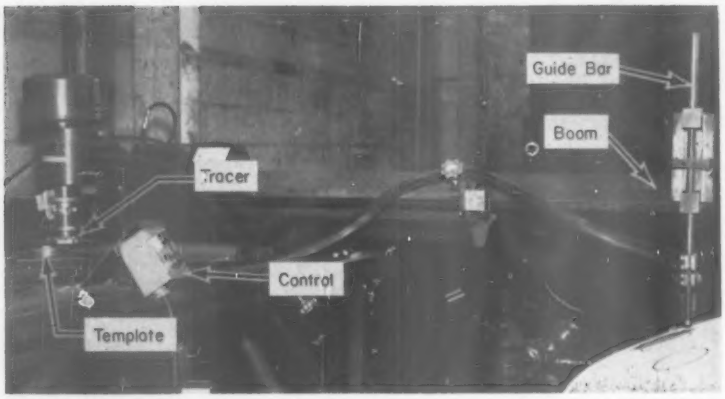
See them both at your A. O. Smith distributor. Or write for full details.

# JIB CRANE & HOIST *Buyers Guide*

| NAME OF MANUFACTURER | JIB CRANES | | | | HOISTS | | |
|---|---|---|---|---|---|---|---|
| | Bracket | Mast | Pillar | Traveling Wall | Air | Electric | Manual |
| Abell-Howe Co. | ● | ● | ● | ● | | | |
| American Engineering Co. | | | | | | ● | |
| Autoquip Corp. | | | | | ● | | ● |
| CPC Engineering | ● | | | | | | |
| Chester Hoist Div., National Screw & Mfg. Co. | | | | | | ● | ● |
| Chicago Pneumatic Tool Co. | | | | | ● | | |
| Chicago Tramrail Corp. | ● | ● | ● | ● | | | |
| Chisholm-Moore Hoist Div., Columbus McKinnon Corp. | ● | | ● | | | ● | ● |
| Cleveland Tramrail Div., Cleveland Crane & Engineering Co. | ● | ● | ● | ● | | ● | ● |
| Coffing Hoist Div., Duff-Norton Co. | | | | | ● | ● | ● |
| Curtis Mfg. Co. | | | | | ● | | |
| Detroit Hoist & Machine Co. | | | | | ● | ● | |
| Ederer Engineering Co. | | | | ● | | ● | |
| Gardner-Denver Co. | | | | | ● | | |
| Harnischfeger Corp. | | | | ● | | ● | ● |
| Hoist & Crane Div., Robbins & Myers, Inc. | | | | | | ● | ● |
| Hoist Equipment Co. | ● | ● | ● | ● | | | |
| Industrial Crane Div., All-State Engineering Co., Inc. | ● | ● | ● | | | | |
| Ingersoll-Rand Co. | | | | | ● | | |
| R. G. LeTourneau, Inc. | | | ● | | | ● | |
| Louden Machinery Co. | ● | ● | ● | ● | ● | ● | ● |
| Manning, Maxwell & Moore, Inc. | ● | | ● | | ● | ● | ● |
| Master Power Corp., Black & Decker Subsidiary | | | | | ● | | |
| Morris, Wheeler & Co., Inc. | ● | ● | ● | ● | | | |
| Ohio Tramrail Div., The Forker Corp. | ● | ● | ● | | ● | ● | ● |
| Philadelphia Hoist Div., Industrial Enterprises Inc. | ● | ● | ● | | | | ● |
| Reading Crane & Hoist Corp. | ● | | ● | ● | | ● | ● |
| Richards-Wilcox Mfg. Co. | ● | ● | ● | | | | |
| Stryco Mfg. Co. | ● | ● | ● | | | ● | |
| Thor Power Tool Co. | | | | | ● | | |
| Wire Rope Div., Jones & Laughlin Steel Corp. | | | ● | | ● | ● | ● |
| Wright Hoist Div., American Chain & Cable Co., Inc. | ● | | ● | ● | | ● | ● |
| Yale & Towne Mfg. Co. | | | | | ● | ● | ● |



*this company gave up on machining because set-up time cost a fortune*




**TORCH GUIDE BAR** moves up and down to follow the contour of the dished head. The holder is fastened to the shape cutter boom which follows a template.

# Cut Dished Stainless Steel Heads With The Tungsten Arc Process

**IN BRIEF: Cutting flat stainless steel with the tungsten arc is done every day. But it's a different story when you cut curved parts.**

TUNGSTEN ARC CUTTING of flat stainless steel is still new enough to be interesting. But it stops you in your tracks when you hear it's used to cut nowhere-near-flat stainless. This is brand new.

It happened at Griscom-Russell Company, Massillon, Ohio when they processed 34 dished heads of types 302 and 309 stainless steel. The heads, about 6½ feet across, were to end up with a large center hole and a Swiss-cheese pattern of 36 smaller holes around it.

Machining, one way to cut the holes, wouldn't do; setup time alone would be sky-high.

So the G-R engineers got to work on tungsten arc cutting. They had no doubts about cutting stainless steel with it; it had been done many times. The only hurdle was how to cut a dished shape? They overcame it by combining some equipment they had with some they bought and some they made.

The company had a shape cutter—built for flame or arc cutting of flat steel. They had a variable-speed positioner. All the positioner needed was a larger turntable to hold the heads.

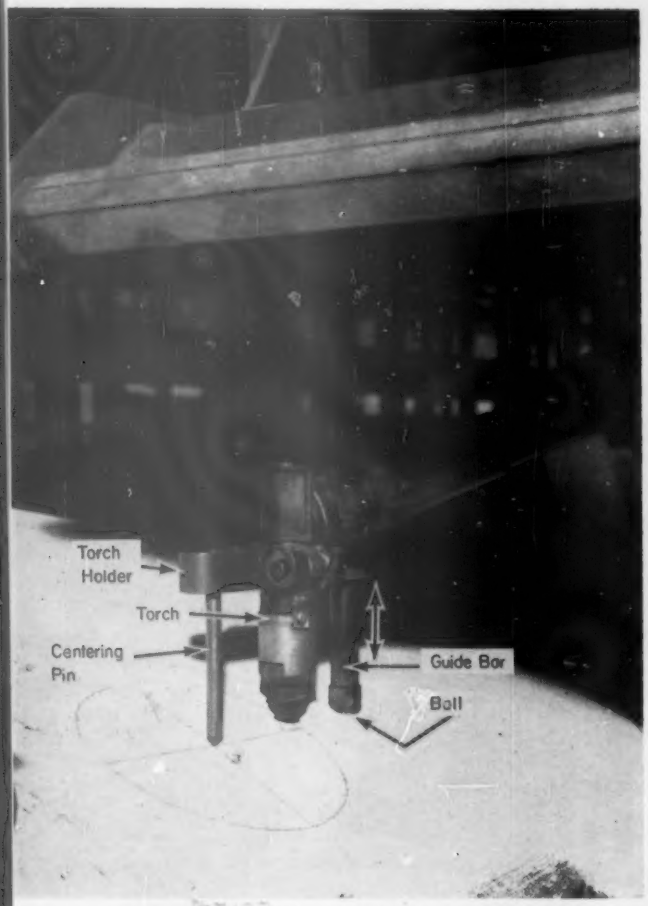
G-R bought a tungsten inert arc cutting torch and a mechanized remote control unit. They also bought nitrogen regulators and flowmeters, a high-frequency generator for quick, sure starts, and a 600-amp, high open voltage motor-generator.

They made a torch holder that would follow the contour of the dished heads. They fastened the holder to the end of the shape cutter boom (see photo). As the boom traces a circle, the torch holder moves up and down to follow the head. The torch holder also positions the torch so that it cuts in the right place. This is done with a centering pin which can be set for two hole sizes.

### SETUP FOR CUTTING

The positioner is set so the shape-cutter boom can reach all cutting positions.

- Line up head, cutting torch, and tracing template centers.
- Put the dished head on the positioner. Line up the head center with the positioner's center of rotation.




**CENTERING PIN** in torch holder is key to accurate cuts. Layout center mark in head must be exact.

**CUTTING SPEED** is 9 to 11 ipm. The small variation in torch distance around the cut doesn't spoil the cut.

- Lay out holes in the dished head. Mark hole centers accurately because the torch will be positioned from them.
- Position the torch holder on the guide bar so that the torch is the right distance from the work during cutting. Actually, the torch-to-work distance is not always the same during cutting, but this variation won't spoil the cut. The trick is to set the minimum distance when the torch is nearest the work.

Griscom-Russell kept out of trouble by paying strict attention to details:

► Grind the included angle of the tungsten electrode to exactly 75 degrees. An electrode with the wrong angle will arc to the side, burn through the torch insert into the water passage. When it does, water will leak into the cutting gas stream.

► Carefully center the tungsten electrode in the torch insert.

Before the operators cut Swiss-cheese holes, they cut a center hole in the head manually. An exhaust hose goes in to the hole to carry off cutting fumes and smoke.

Here's Griscom-Russell's step-by-step production cutting procedure:

1. Set the tracer. Put a centering pin into the torch holder. Rotate the turntable until the pin centers the hole layout on the head.
2. Since the path of the guide bar traces overlaps the hole being cut, start the cut so the guide bar completes the overlap before that part of the hole is cut. Start the tracing drive, then the arc.
3. Use these settings for cutting $\frac{3}{8}$- and $\frac{1}{2}$-inch thick heads:
   Speed: 9 to 11 ipm
   Amperage: 425
   Nitrogen flow: 100 to 110 cfh.
   Torch to-work distance (at start) : 3/16-inches.
4. Return the torch to the starting position when the hole is cut, rotate the turntable for the next hole, and cover the hole just cut so that the exhauster will continue to get rid of fumes.
5. After the small holes, the big one. Line up the cutting torch with the marked circle, and leave it there. Rotate the turntable at cutting speed.

The Griscom-Russell setup did a fast, cleancut job. The little slag that formed on the cuts was quickly ground off. • •

# How Republic Steel Rates Nondestructive Tests

by W. A. BLACK,
*assistant research director, Electromechanical Research Center, Republic Steel Corp., Cleveland, Ohio*

**IN BRIEF: Republic Steel looked for the best method for nondestructive testing of resistance welded tubing. They found it in the thoroughness and economy of electromagnetic induction testing.**

WHEN YOU MAKE TUBING for aircraft, marine boilers, or heat transfer equipment, as we do, it's got to be good. We've resistance welded thousands of miles of tubing. We know that every tube we ship is sound and strong. Nondestructive testing tells us so.

It's true, all nondestructive tests used on tubing make mistakes. No test infallibly detects all the defects that should be rejected. But the errors made by the different tests differ, since they operate under different basic principles.

Because of these errors, complete quality assurance can be obtained only from the use of a combination of techniques. But this is not economical, unless the job is supercritical.

So the producer must compromise in choosing a nondestructive test. He's got to keep testing costs down but, at the same time, prevent failures. The test must be fast, it must be insensitive to harmless defects, it must not rely on the operator's judgement, and the equipment must not cost too much.

The best all-round test for welded tubing we have found is electromagnetic induction. We call it Farrowtesting—and we've tested 57,000 miles of tubing with it.

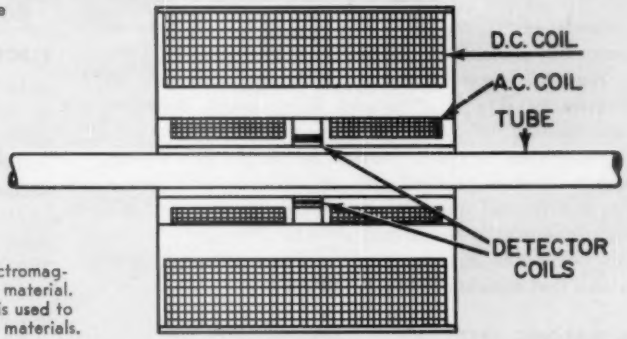
Of course, we've evaluated the other nondestructive tests too. Here's what we have learned:

## HYDROSTATIC TEST

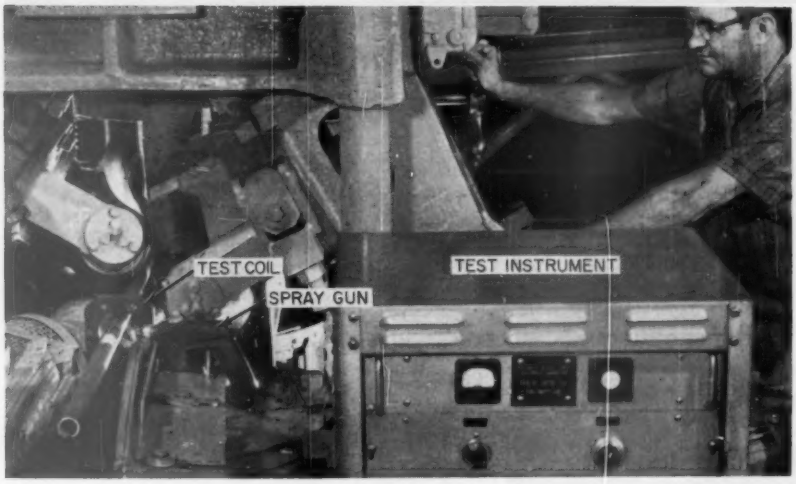
This is the best-known and most-used nondestructive test for tubing. The trouble is, hydrotest lets harmful defects pass. To prove this, we milled slots in strips of steel, formed the strips into tubes, and welded the seams. We drew the tubes smaller until we closed the slots tightly. Then we hydrotested. We used pressures that produced fiber stresses up to 47,000 psi, and we held pressure much longer than the specifications require. Here's what got by:

- Hydrotest passed defects that were 90 percent through the tube wall and up to 1.5 inches long.

**57,000 MILES** of resistance welded pipe and tube have passed through Farrowtest (electromagnetic induction) machines. Sound tubes drop into the big pile; marked rejects fall on the other side and are given a close look later.




**TEST COIL** arrangement for electromagnetic inspection of magnetic material. Another coil arrangement is used to test nonmagnetic materials.




**MAGNETIC INDUCTION TESTING** and processing operations go together. Any defects created by this straightening machine are caught and spray-marked automatically.

- Hydrotest passed defects that were 50 percent through the tube wall and up to 7.7 inches long.
- Hydrotest passed large defects, even at 8,000 psi, in 1.75-inch by 10-gage tubing. Examples: It passed 2.7-inch-long defects, 46 percent through the wall; and 1.4-inch-long defects, 94 percent through the wall.
- Tubes can still fail in lowpressure service after passing a short-time, high-pressure hydrostatic test. Hydrotest actually increased the chance of failure of some tubing instead of guarding against it.

### RADIOGRAPHIC TEST

In this test, high frequency x-ray and gamma rays penetrate the tube wall and record an image (called shadowgraph) on a sensitive film or fluorescent screen. The film method is too slow and too expensive for 100-percent inspection of tubing. The fluorescent screen or television receiver is faster, but the image takes constant watching and interpretation.

Defects in resistance welded tubing don't radiograph well. They are usually radial, longitudinal, and tightly closed. There's so little air, gas, or oxide in them that there is practically no radiation absorption.

Hence, the defect won't show on the shadowgraph.

### MAGNETIC PARTICLE TEST

The part is magnetized and tested with a magnetic powder—either dry or suspended in liquid

*continued on page 44*

**FARROWTEST REJECT TABLE**

| Wall Thickness (B.W. Gage) | Minor dimension of the defect (Length or Depth) | Defective Area (Length, Depth Plane) |
|---|---|---|
| 20 | .006" | .0025 sq. inches |
| 18 | .006" | .003 sq. inches |
| 16 | 12½% of wall | .003 sq. inches |
| 14 and 13 | 12½% of wall | .004 sq. inches |
| 12 and heavier | 12½% of wall | .005 sq. inches |

**FARROWTEST** detects and rejects not only tubing containing defects which completely penetrate the wall; but also tubing with defects equal to, or greater than, those shown in this table. For irregular defect shapes, a tube with defect area equal to or greater than shown above is rejectable. Where required, sensitivity of FARROWTEST equipment can be calibrated to reject defects of lesser specified area than shown in table, at extra cost.

## NONDESTRUCTIVE TESTING

*continued from page 43*

(sometimes fluorescent). The defects are centers of magnetic attraction, which draw the particles into a readily detected pattern. If the particles are in fluorescent liquid, ultraviolet light makes detection even easier.

Sometimes magnetic particle inspection is the only way to test a product, but we have found that it has but limited application in inspecting tubing. It's mainly sensitive to surface defects. The farther you get below the surface, the less its sensitivity. This means that rejectable defects will get by.

### ULTRASONIC TEST

More and more, this test is used to test pipe and tubing. A high-frequency mechanical vibration projected into the tube signals a defect by reflecting energy from it. It is an extremely good test for detecting internal defects.

The contact and immersion methods are used. In the contact method, the vibrating source touches the piece being tested. In the immersion method, the vibration passes from source to test piece through a liquid.

In the last three years, ultrasonic inspection of tubing has gotten even better. Machines discriminate better than they used to—and there are fewer harmless signals. One of the stumbling blocks used to be: How big is the defect? Now it can be determined from the signal.

### ELECTROMAGNETIC INDUCTION TEST

In this test, an electrical eddy current is induced in the pipe or tube. Defects change the induced current and produce a signal. Farrowtest, with adjustable sensitivity, rapidly finds surface and subsurface defects.

The tube being tested goes through an a.c. solenoid coil. Current frequencies range from 60 to 200,000 cps. The higher frequencies are used on small, thinwall, nonmagnetic materials such as stainless steel.

When we test magnetic materials we usually saturate the tube magnetically. This increases the sensitivity to genuine defects but not to the ever-present harmless variables. A d.c. solenoid outside the a.c. one generates a powerful magnetic field. Our production coil is water-cooled, carries low-voltage, high current.

The Farrowtest sensing device is one or more coils next to the tube. An electronic circuit evaluates the output of the detector coil.

We've found that you can't measure the worth of a nondestructive test only on the basis of sensitivity. High sensitivity signals minute defects, but it also signals harmless indications such as, grain size, stress concentrations, and inclusions. Actually, discrimination is more important than sensitivity.

What complicates matters is that a defect that is objectionable for the job one tube is to do may be acceptable for another. Example: A pinhole leak may be disastrous in a liquid-carrying tube but unimportant in a structural tube.

### WHAT IS HARMFUL OR HARMLESS

Magnetic induction machines are calibrated to make them discriminate between harmful and harmless defects. It's done with a tube containing artificial defects. Of course, artificial and actual defects of the same size act differently electrically, but useful standards and setups can be obtained if they are carefully compared. In fact, calibration makes it possible for all Farrowtesters to inspect the same way. Tubes tested at different times on different machines give identical signals.

A typical magnetic induction machine panel has these defect indicators (used to set up the machine and for troubleshooting): signal light, a cathode ray oscilloscope, an ammeter, and a recording oscillograph. In production, a defect stops the tube and the inspector marks off and examines the defect. An automatic setup is used too: a defect stops the machine and automatically triggers a paint spray gun which marks the tube. When the spray stops, the tube ejects to a reinspect cradle; good tubes go into a separate cradle without stopping.

Until recently, Farrowtesting was limited to use on pipe and tube up to 4 inches in diameter. Now it's being used on sizes up to 16 inches. • •

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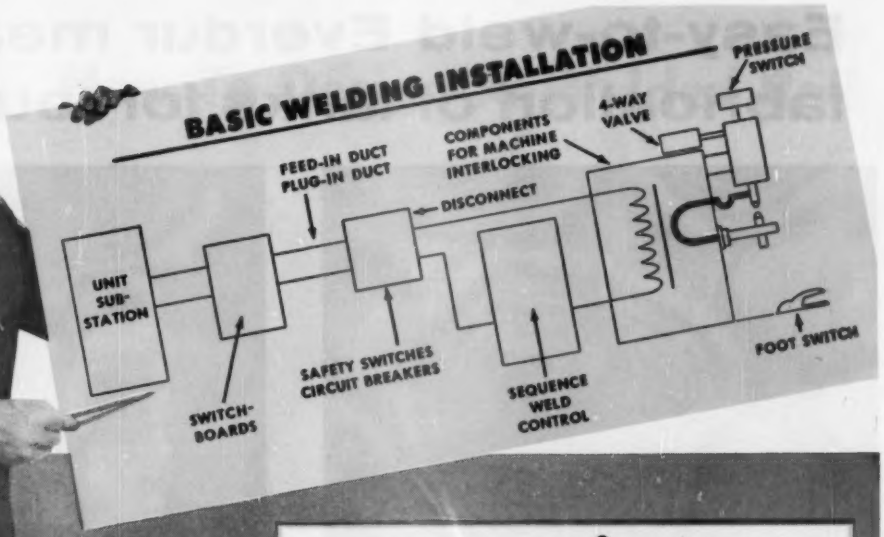



# Here's the Easy Way

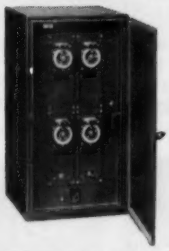
## TO A BETTER WELDING INSTALLATION

• Whether you start from scratch or expand an existing operation, your Square D Field Engineer has two important things to offer to make your job easier.

First, he has the background which enables him to offer sound counsel at the planning stage. Second, he is backed by a complete line of performance-proven electrical equipment with which to put practical planning into action.

Field Engineers are available through Square D branch offices in all principal United States cities—and in Canada, Mexico and England. Backing up these engineers are the design and manufacturing facilities of 20 strategically located Square D factories and the localized services of a nation-wide network of authorized electrical distributors.

## SQUARE D DOES THE *Complete* JOB!



ELECTRONIC and MAGNETIC WELDER CONTROL

SUBSTATIONS

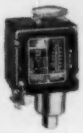
SWITCHBOARDS

FEED-IN DUCT

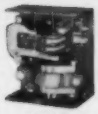
PLUG-IN DUCT

SAFETY SWITCHES

LIMIT SWITCHES



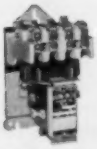
PRESSURE SWITCHES



4-WAY VALVES

PUSHBUTTONS

SELECTOR SWITCHES



CONTROL RELAYS

FOOT SWITCHES

PILOT LIGHTS

**SQUARE D COMPANY**

***wherever electricity is distributed and controlled***

**For More Information Circle No. 71 on Reader Service Card.**

# Easy-to-weld Everdur means fast fabrication of tanks for tough jobs

**A hot-water storage tank starts** by rolling a plate of Everdur-1010 (29¾" x 170" x .282") to form one of four cylindrical sections. The fabricator, Old Dominion Iron and Steel Corporation of Belle Isle, Virginia, finds Everdur-1010 easy to roll cold.

**The edges of the plate are beveled and butted** to form a vee groove which is then welded to complete the section. Everdur-1010 is readily joined by all welding processes, with especially good results obtained by the inert-gas arc welding process.

**The tank is completed** by Mig welding two flanged-and-dished heads to the shell. The heads were formed and spun right in the shop from circles of Everdur-1010 (60½" in diameter x .383" thick)—further testimony to the easy workability of Everdur.

**Completed hot-water storage tanks** await shipment to an overseas hotel. Each tank has over 160 feet of welds. All were made with Everdur-1010 welding rod and wire. And all meet rigid ASME Boiler and Pressure Vessel code requirements for soundness, strength, and ductility.

Everdur® copper-silicon alloys, produced by Anaconda, have strength and toughness to resist service stresses caused by mechanical loading, pressure, and temperature changes. They resist attack from a variety of corrosive materials—from hot water to liquid oxygen plus a host of chemicals. Also, they are virtually nonmagnetic and, depending on the alloy, readily machined and suitable for hot and cold working.

In addition, Everdur-1010, the wrought plate alloy, is easy to weld by all welding processes, and especially by the modern inert-gas arc methods. This, in combination with its other valuable properties, has made it extremely useful to manufacturers and users of heat transfer and processing equipment. For technical information and help in selecting the proper alloys for your applications, write: Anaconda American Brass Company, Waterbury 20, Connecticut.

6088

**EVERDUR**

**COPPER-SILICON ALLOYS**

*Products of*

**ANACONDA®**

*Anaconda American Brass Company*

**For More Information Circle No. 9 on Reader Service Card.**

# How To Design A Welded Roll

**IN BRIEF: Elements of machines can cost a lot and still not do the job they're supposed to do if they are not properly designed.**

BEFORE WELDING was thought of, it was common to make machine rolls by pressing discs on the ends of a shaft, then pressing a shell on the discs. It wasn't good design: The shaft took most of the bending load instead of transferring it to the shell through the discs.

Today, the way to make a roll is to weld it. But half the battle is knowing which welded design suits your application. That's why the Lincoln Electric Company has developed this study on the design of welded rolls.

In a welded roll, all the parts act together. The shaft transfers the load to the shell, so a full-lengh shaft isn't necessary. A full-length shaft would contribute little to the resistance of the roll to bending and twisting. For normal loads, a single disc at each end of the roll suffices. The disc, supported as it is around its edge, bears the brunt of the bending moment of the shaft. A bending moment, by the way, is the sum of the bearing force and the distance the force is from the center of the disc.

The size of the bearing load determines how thick you make a disc. You can quickly find how thick to make a disc for a given radial tensile stress by consulting the nomograph, *Stress In Trunnion Disc*, on the next page. Remember, the stress on a rotating disc reverses every half revolution; so figure how much fatigue strength (in tension) you'll have to have for a complete reversal.

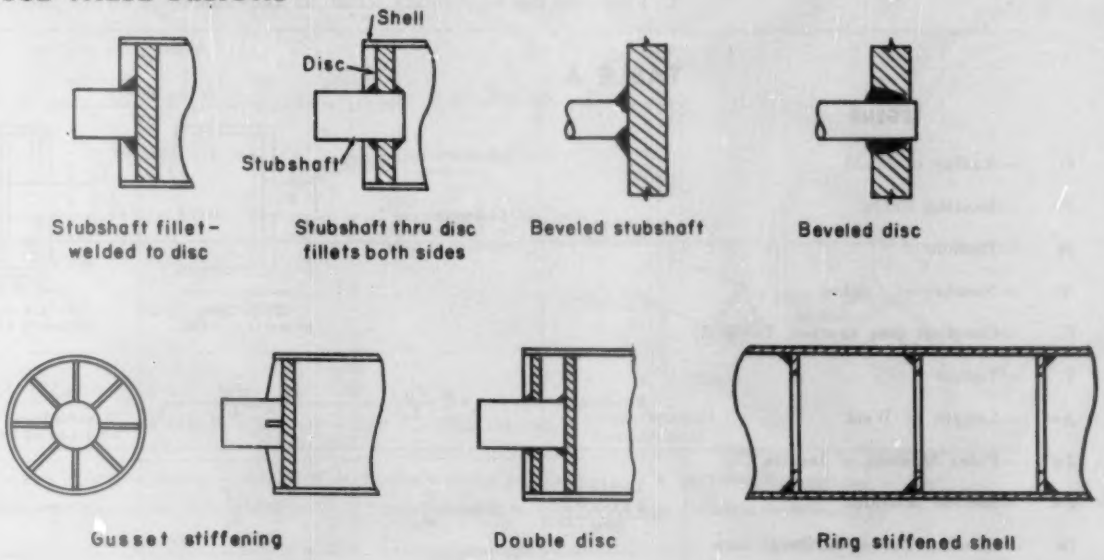
In a welded roll, the stubshaft sometimes goes through a hole in the disc and is fillet-welded both sides. But more often, the stubshaft is simply butted against the disc and welded to it with a heavy fillet. This saves shafting and it saves cutting holes. When bearing loads get heavier, bevel the disc I.D. or bevel the shaft, to get more strength.

If you want even more strength and stiffness, weld radial gussets between shaft, disc, and shell. If your loads are so heavy that they require extra-thick discs, use two thinner, separated discs at each end of the roll. Weld the inner disc to the stubshaft, then weld this assembly into the roll. Last, slip the outer disc into place and weld.

In the old days, they used to stiffen cast rolls with lengthwise ribs—for that was the only practical way. Now rolls can be stiffened better and more uniformly by welding several rings inside the shell.

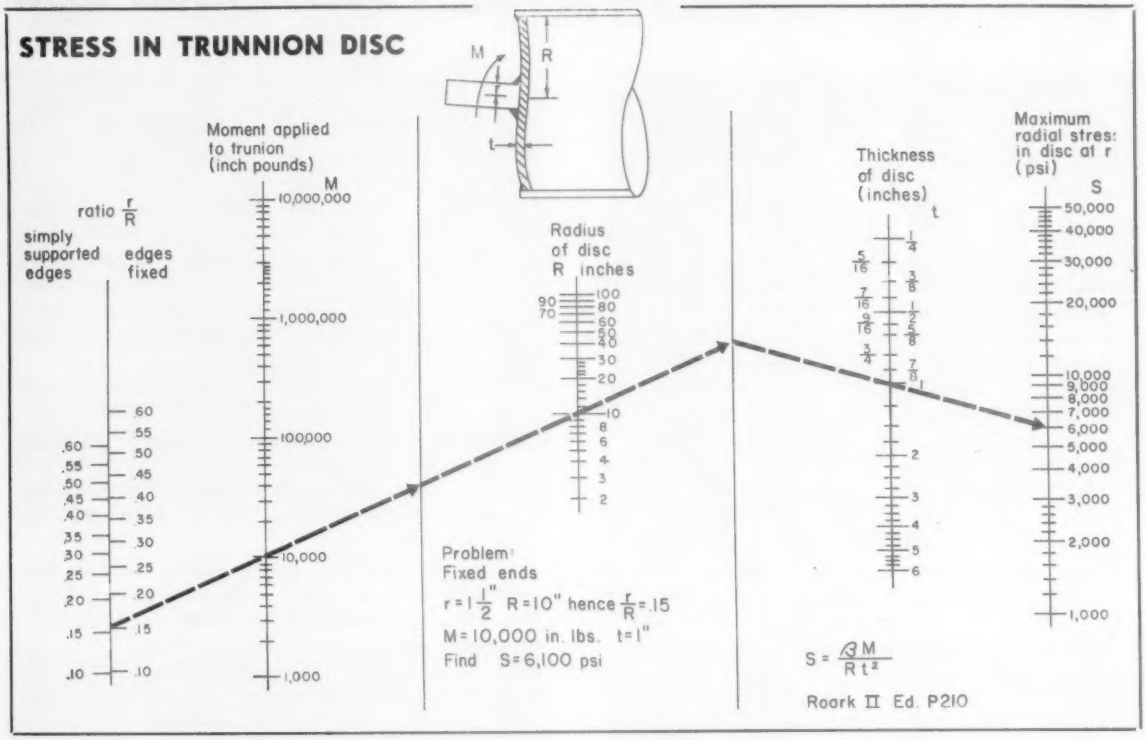
The critical point of a welded roll is the weld between stubshaft and disc. This weld bends and twists much more than the disc-shell weld—and the smaller its radius, the greater the force. This is partly due to the greater bending moment, partly to the shorter weld. Thus, you can weld the disc to the shell with a fillet, but you have to use groove or double fillet welds at the hub.

## USE THESE DESIGNS




*. . . then turn page to find disc thickness*

## STRESS IN TRUNNION DISC




## FIGURE WELD SIZE THIS WAY

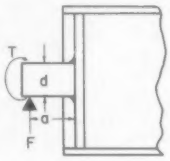
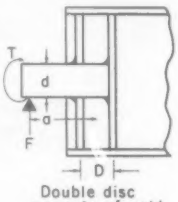
You know how thick to make the roll discs (nomograph); now determine the size of hub welds. The simplest way is:

1. Think of the weld as a line, and use standard bending and torsion formulas to find the unit forces on it.
2. Vectorally add these forces occuring at the same part of a welded joint to find the force on the weld.
3. Find weld size by dividing actual- by allowable-force for the particular weld.

**LEGEND**

- **C** —Radius of Weld
- **F** —Bearing Force
- **M** —Moment
- **N** —Number of Cycles
- **K** —Constant (see caption, Table B)
- **T** —Torque
- **Aw** —Length of Weld
- **Jw** —Polar Moment of Inertia
- **Zw** —Section Modulus
- **fb** —Bending Force, lb./linear inch
- **ft** —Twisting Force, lb./linear inch
- **fv** —Vertical Shear, lb./linear inch

## TABLE A

| Load condition | Design formula for force on weld lbs/inch of weld |  Single disc property of weld |  Double disc property of weld |
|---|---|---|---|
| Bending | $f_b = \frac{M}{Z_w} = \frac{F\,a}{Z_w}$ | $Z_w = \frac{\pi d^2}{4}$ | $Z_w = \frac{\pi d^2}{2} + \pi D^2$ Assume loose fit and weld carries whole load |
| Twisting $T = \frac{63{,}000\,hp}{RPM}$ | $f_t = T\left(\frac{C}{J_w}\right)$ | $\frac{J_w}{C} = \frac{\pi d^2}{2}$ | $\frac{J_w}{C} = \pi d^2$ |
| Vertical | $f_v = \frac{F}{A_w}$ | $A_w = \pi d$ | $A_w = 2\pi d$ |

## TABLE B: ALLOWABLE FATIGUE STRENGTH OF WELD METAL

| | N = 2,000,000 ~ | N = 600,000 ~ | N = 100,000 ~ | |
|---|---|---|---|---|
| BUTT WELD TENSION | $\frac{13{,}500}{1-\frac{K}{2}}$ psi | $\frac{15{,}000}{1-\frac{K}{2}}$ psi | $\frac{18{,}000}{1-\frac{K}{2}}$ psi | but not to exceed 18,000 psi |
| BUTT WELD SHEAR | $\frac{9{,}000}{1-\frac{K}{2}}$ psi | $\frac{10{,}000}{1-\frac{K}{2}}$ psi | $\frac{12{,}000}{1-\frac{K}{2}}$ psi | 13, 000 psi |
| FILLET WELDS w = leg size | X $\frac{5090w}{1-\frac{K}{2}}$ lb/in | $\frac{7070w}{1-\frac{K}{2}}$ lb/in | $\frac{8484w}{1-\frac{K}{2}}$ lb/in | 8800w lb/in |

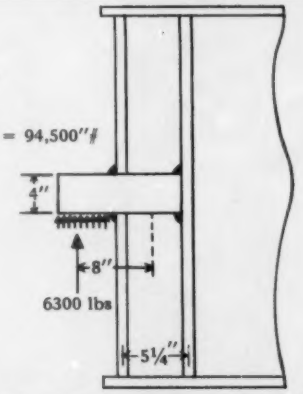
**EVERY TIME** a roll rotates half a revolution, the bending forces and the weld completely reverse. The weld is under fatigue loading in which K -1, that is, the minimum force is equal to a negative value of the maximum force, or a complete reversal of force.

## EXAMPLE

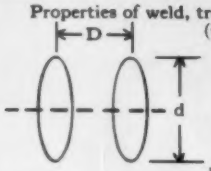
**GIVEN:** Load on trunnion: Bearing load =6300 lbs - torque transmitted =150 HP at 100 RPM **FIND:** Fillet weld size at hub

step #1

$$T = \frac{63{,}030\ HP}{RPM} = \frac{(63030)\ (150)}{(100)} = 94{,}500''\#$$




Properties of weld, treated as a line (weld at hub)




use Table A

$$\frac{J_w}{c} = \pi d^2 = \pi\ (4)^2 = 50.3\ in^2$$

$$Z_w = \frac{\pi\ d^2}{2} + \pi\ D^2 = \pi\left[\frac{(4)^2}{2} + (5\tfrac{1}{4})^2\right] = 111.7\ in^2$$

$$A_w = 2 \times \pi\ d = 2\pi\ (4.) = 25.2\ in$$

step #2 use Table A

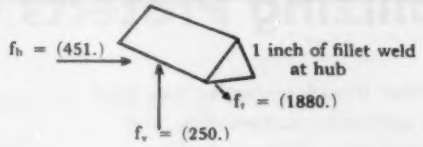
bending: $f_b = \frac{M}{Z_w} = \frac{(6300)\ (8)}{(111.7)} = 451.$ lbs/inch

Twisting: $f_t = \frac{Tc}{J_w} = \frac{(94{,}500)}{(50.3)} = 1880.$ lbs/inch

vertical shear: $f_v = \frac{V}{A_w} = \frac{(6300)}{(25.2)} = 250.$ lbs/inch

step #3

$$f_R = \sqrt{f_b^2 + f_t^2 + f_v^2}$$




$$f_R = \sqrt{(451.)^2 + (1880.)^2 + (250.)^2} = 1950.$$ lbs/inch actual resultant force on weld

Since this is fatigue loading — assume **N** = 2,000,000 cycles and use formula X of Table **B** — assume in this case a complete reversal of load and let **W** = 1 inch, hence $K = \frac{min}{max} = -1$ and allowable force would be

$$f = \frac{5090}{1-\frac{K}{2}} = \frac{5090}{1+\frac{1}{2}} = 3390$$ lbs/inch (allowable)

step #4 leg size $W = \frac{1950}{3370} = .56$ in. or use ⅝ in ◺

**CUT:** threading removes galvanizing, the zinc rust barrier.

**HEAT** threaded ends metallizing-hot with gas burners.

**METALLIZE** both ends of conduit, automatically, with an even coat of zinc.

by **HENRY LEFER,**
*eastern editor*

# Metallizing Protects Conduit, Boosts Sales

**IN BRIEF: Other thread protection was tried but failed in uniformity, rustproofing, and looks. Metallizing gives all three.**

WHEN YOU THREAD the ends of galvanized conduit you cut off the zinc coating—and the uncoated threads are apt to rust.

The Steelduct Company of Youngstown, Ohio and Sharon, Pa., automatically replaces this zinc with metallizing.

In the 40 years Steelduct has been making hot dipped galvanized conduit, they've tried several ways of protecting threads. None of them worked. Varnishes and lacquers failed to rustproof and looked bad. They tried cutting the threads before galvanizing, but they couldn't get an even coating on the threads afterwards.

Two years ago Steelduct switched to spray metallizing. It coats the threads with a uniformly thick coating, imparts excellent rust resistance and good looks. An even coating means uniform thread clearance, and that means the couplings run on, or off, easier. Moreover, the zinc makes the steel conduit better able to absorb stray electrical discharges.

*continued on page* 54

# ARC "MACHINING" ANY TOUGH-TO-CUT METAL ON-THE-JOB WITH NEW AC CHAMFERTRODE® • Seven years ago, EUTECTIC's research conceived, developed and patented an exclusive process: "machining" metal anyplace with a blast from a DC electrode. Now, a brilliant follow-up to its DC forerunner... ChamferTrode AC-DC... brings AC shops and "field" outlets the advantages of cutting, gouging, chamfering any metal... No gasses, no air, no special holder or equipment. Truly universal, ChamferTrode AC-DC brings electrode "machining" to every weldor... on-the-job... anyplace in the world.

OTHER STRIKING FACTS... ChamferTrode AC-DC offers improved formulation terrific for stainless steels, hard metals, manganese and carbon steels, cast iron, copper alloys, monel. Tops on contaminated metals! Other features include • Lower burn-off rate • Excellent re-striking qualities for intermittent gouging; famous re-strikability further increased • Lower starting current; larger diameter electrodes may be used. With ChamferTrode AC-DC, no gasses or special equipment are needed.

SUMMING UP: ChamferTrode AC-DC permits you to go to the job with the electrode... instead of bringing the job to the machine. It represents one of the greatest advances in the state of the art of welding since Eutectic's original concept of cutting with an arc. Send the coupon below, now!

® Reg. T.M. Eutectic Welding Alloys Corp.

Please send complete literature on ChamferTrode® AC-DC.

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Low Temperature EUTECTIC WELDING ALLOYS

## EUTECTIC WELDING ALLOYS CORPORATION

40-40 172nd Street • Flushing 58 • New York

Originator of the Low Heat Input process... The ONLY welding alloy manufacturer in the world capable of producing welding rods and electrodes from virgin metals to finished products in ANY metal.

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**A reindeer brings you Season's Greetings when you write to *SANTA CLAUS***

*(specialist in world peace)*

# A Field Engineer brings you profitable ideas when you write to *LINCOLN*

*(specialists in arc welding)*

WRITING to Santa Claus is an exciting experience for the whole family. Eager faces . . . pencilled lists . . . crackling fire . . . and the air alive with expectancy. And then the long, almost unending wait until Christmas, when miraculously St. Nick generally delivers even a little more than was desired. This is why we have faith in him. That's the spirit of Christmas!

Now, we don't say our Field Engineers will arrive in sleighs filled with toys, but this we can guarantee: if you write a letter to LINCOLN, the Field Engineer who calls will be able to give you a good deal more help than you expected. Not only does he know welding products but also the best procedure to use on each job. He understands how to relate welding profitably to your total manufacturing operation.

That's why so many companies who have had faith in LINCOLN for over fifty years say, "It's a good idea to do business with LINCOLN where arc welding is a specialty and cost reduction comes to you as a 'plus' at no charge."

Merry Christmas!

THE LINCOLN ELECTRIC COMPANY
Dept. 13100 • Cleveland 17, Ohio

LINCOLN WELDERS

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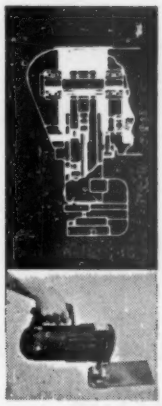
For More Information Circle No. 29 on Reader Service Card.

CUT 1/4 INCH STEEL PLATE EASILY AND IN ABSOLUTE SAFETY

*with the* **FENWAY** MODEL EHN

**heavy duty NIBBLER**



**The new, lightweight Fenway 1/4" Nibbler cuts through 1/4" cold or hot rolled steel plus 5/16" aluminum, quickly and easily. Also cuts 8 gauge stainless. Its special design provides absolute safety to the operator and will cut without distortion to material. Clean cutting action reduces need for grinding and buffing edges. Has minimum cutting radius of 8". Weighs only 20 lbs. SEND FOR COMPLETE SPECIFICATIONS OR ASK FOR FREE DEMONSTRATION IN YOUR AREA.**

*Other Fenway Nibblers are available for a variety of cutting jobs ...help reduce costs as much as 75%.*

**FENWAY MACHINE CO., INC.**
**1910 N. Marshall St., Phila. 22, Pa.**

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**HELMET and SAFETY CAP COMBINATIONS**

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No. 602 -3-C

**FIBRE and FIBERGLAS**

"Combinations" have *QUICK-LOK* Attachment! FIBRE-METAL features Light weight, Exceptional strength, Heat resistance, Wide range headsize adjustment, 4-position helmet stop, Durability and long life.

Fiberglas models are Moisture-proof (non-warping), Self-extinguishing and Easily sterilized.

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The WORLD'S LARGEST MANUFACTURER of SUPERIOR PROTECTIVE EQUIPMENT

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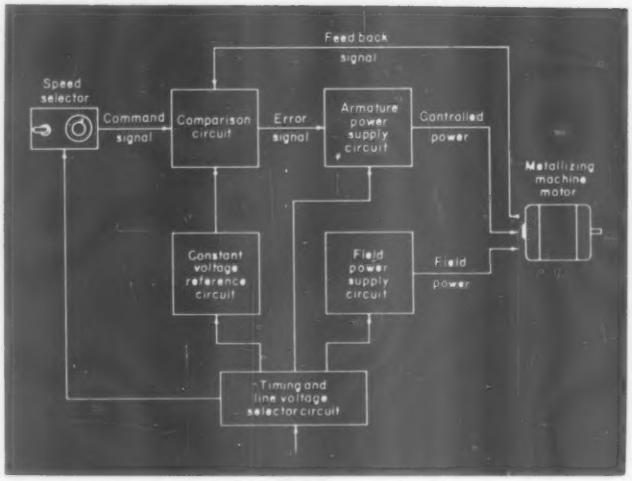
## METALLIZING

*continued from page 50*




**METALLIZING SCHEMATIC:** Machine motor will automatically respond to speed selection and line voltage variations.

### A POUND OF WIRE AN HOUR

Steelduct makes the conduit on two automatic lines. It has Metco Inc. Type K metallizing guns and Type C automatic controls. There is a gun at either end of each line. Zinc wire (15 gage) feeds through the guns from 600-lb. drums. The guns use a pound of wire an hour, so a drum lasts 600 hours. It takes only ten minutes to switch drums.

They make conduit in 10-foot lengths, in 1/2- to 6-inch diameters. After threading, they heat the pipe ends to metallizing temperature with gas burners. Then a conveyor hustles the pipe into metallizing position where the pipe automatically turns as the ends are sprayed. The guns use acetylene gas. Then the pipe moves through a zinc dichromate bath, painting, baking, and finally, inspection. After inspection, workers apply couplings, thread protecters, and labels.

### GUNS GO BY THEMSELVES

Each production line has a crew of 12. But the metallizing guns go by themselves. The little attention they need they get regularly. It consists of valve lubrication and feed roll cleaning. And of course, they have to change the gas-mixing nozzles to suit different pipe diameters.

Electronic speed control monitors the metallizing guns (see schematic diagram, above). It gives them wire speeds from 9 ipm to 40 fpm, without need to change the grip on the wire or the position of the gas head. A built-in, quick-reset counter shows the exact amount of metal sprayed.

The control panel is fail-safe. It shuts off the gun if the air, oxygen, or fuel supply fails. Limit switches on the conveyor regulate when the guns idle and when they spray.

J. H. Collier, president of Steelduct, thinks the little extra he pays for metallizing is well worth it. He proves the point when he says: "Metallizing has definitely increased our sales." • •



For More Information Circle No. 82 on Reader Service Card. ⟶

LINDE COMPANY

UNION CARBIDE

# UNIONARC

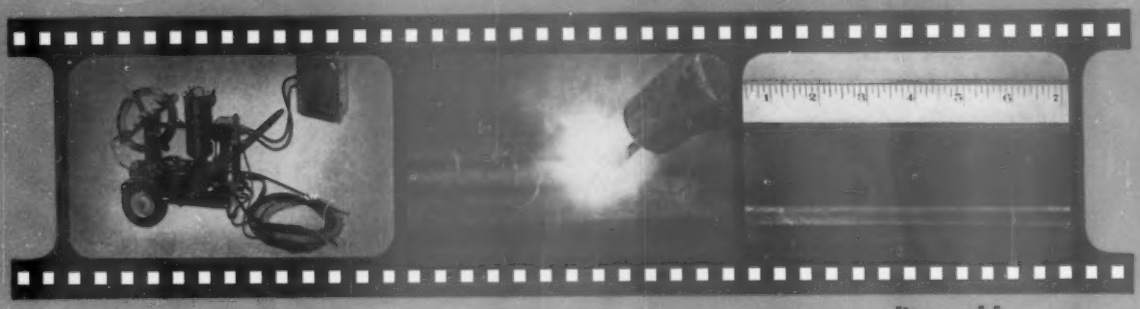
## *REDESIGNED...REBUILT...RELIABLE*

**Development of a LINDE welding process does not stop with its introduction. In the past 18 months, we have invested over 3000 laboratory manhours to further improve the UNIONARC welding process and equipment. New: portable UAM-2 machine, simplified UAW-2 torch, refined consumables. Improved equipment for an improved $CO_2$ steel welding process, featuring**

- **...wear-resistant flux and wire-guide tubes, super-hard "Stellite" torch body**
- **...automatic flux-$CO_2$ shutoff valve for precise flow of consumables**
- **...stainless-steel hopper funnel for smooth flux feed**
- **...serrated V-groove drive roll (patent pending) for positive wire feed**
- **...miniature machine—300 lbs. lighter, uses 50% less space**
- **...refined flux that increases metal deposition rates**
- **...proven results: dependable operation with minimum maintenance.**

**For field-tested application details, see next page**

# UNIONARC



**Portable machine . . .** **produces 30-ipm . . .** **top-quality welds**

**One of the nation's largest construction-equipment manufacturers field-tested 15 UNIONARC UAM-2 machines full time—three shifts a day, six days a week—over 2000 hours per week. Maintenance has averaged less than ½ hour per machine per week, a downtime factor of less than 0.5 per cent. This is tested reliability that insures process advantages:**

- **. . . cost as low as 27¢/lb. of metal deposited**
- **. . . deposition rates as high as 25 lb./hour**
- **. . . speed over 30 ipm on ¼ in. carbon-steel fillets**
- **. . . quality to strictest specifications—ASME, Military, Bureau of Shipping**
- **. . . full penetration requiring less preparation, fewer passes, less wire.**

**On a production basis, these advantages mean substantial savings. A western pipe manufacturer saved 25¢/ft. of weld on 28,000 feet of welds. A southwestern fabricator reduced welding time on three on-site storage tanks (9500 ft. of welds) from 1850 manhours to only 700 manhours. A northern manufacturer eliminated expensive reworking of code assemblies, gained 100% weld acceptance with UNIONARC compared to 50% to 90% with covered electrodes. A mid-western manufacturer eliminated beveling, and reduced pass and wire requirements on Schedule 40 pipe by 2:1 and 8:1 ratios respectively.**

**UNIONARC welding is an ideal process for carbon steel. On a production basis, it is unquestionably faster and more economical than other $CO_2$ or covered electrode processes. It uses a wide range of readily-available, low-cost wires that meet any application need. It uses one flux, one low-cost $CO_2$ shielding gas. It has the speed and weld quality of manual submerged-arc welding, with the advantage of weld visibility. It is a sound, well-engineered process designed primarily for repetitive, high-production work on carbon steel. For these applications, the new UNIONARC UAM-2 machine offers outstanding cost advantages with a field-proven low-maintenance factor that produces clear-cut profit for its user. For detailed information or a live demonstration, call your nearest LINDE office.**

"Linde," "Unionarc" and "Union Carbide" are registered trade marks of Union Carbide Corporation

**LINDE COMPANY** **UNION CARBIDE**

Division of Union Carbide Corporation
270 Park Avenue, New York 17, N. Y.

# Why Stress Relieve Cryogenic Vessels Made From 9% Nickel Steels?

**IN BRIEF: Test program shows that tanks and pressure vessels made from 9% nickel steels will withstand impact shocks and high pressures at low temperatures—without stress relieving.**

QUENCHED AND TEMPERED 9 percent nickel steel has the same excellent low-temperature properties that conventional double-normalized and tempered 9 percent nickel steel has!

Vessels built for low-temperature service from 9 percent nickel steels with either heat treatment need not be stress relieved!

These are the important facts brought out by *Operation Cryogenics*, a testing program conducted jointly by International Nickel Co., Inc., U. S. Steel Corp., and Chicago Bridge & Iron Co.

A series of tests showed that the quenched and tempered 9 percent nickel steel has low temperature notch toughness equal or superior to that of the double-normalized and tempered materials called for in present code requirements. (Tensile strengths are about equal, but the quenched and tempered material has a somewhat higher yield strength.) The participating companies feel the acceptance by code-regulatory bodies of this steel in the quenched and tempered condition would make it more attractive to designers and fabricators since it is less costly to make, consequently less expensive to the user.

This steel is notch tough with either heat treatment. That means it will resist brittle fracture even in the presence of pronounced residual stresses, such as those that might be found in as-welded vessels. The participating companies feel this should make it possible to do away with the stress relief now required after welding.

### DESIGN DATA

Economically attractive design advantages, together

*continued on next page*

### CHEMICAL COMPOSITION

| ASTM A-353 Grade | C | Mn | P | S | Si | Ni |
|---|---|---|---|---|---|---|
| A | .13 max. | .80 max. | .035 max. | .040 max. | .15/.30 | 8.50/9.50 |
| B | .13 max. | .90 max. | .035 max. | .040 max. | .15/.30 | 8.50/9.50 |

### DESIGN DATA

| ASTM A-353 Grade | Tensile Strength psi, min. | Yield Point (0.2% Offset) psi, min. | Elongation In 2 in. pct., min. | Allowable Design Stress ASME, psi, max. | Lowest Test Temp. °F ASTM A-300 |
|---|---|---|---|---|---|
| A | 90,000 | 60,000 | 22 | 22,500 | —320 |
| B | 95,000 | 65,000 | 20 | 23,750 | —320 |

### TENSILE PROPERTIES

| Plate Thickness in. | Heat Treatment | Hardness BHN | Tensile Strength psi | Yield Strength psi | Elongation Per Cent | | Reduction of Area Per Cent |
|---|---|---|---|---|---|---|---|
| | | | | | In 2 in. | In 8 in. | |
| 0.5 | Double Normalizing, 1650 F and 1450 F, Tempered 1050 F | 229 | 104,500 | 81,000 | ... | 18 | ... |
| 0.5 | Quenched 1450 F, Tempered 1050 F | 241 | 104,500 | 97,000 | ... | 18 | ... |
| 2.0 | Double Normalized, 1650 F and 1450 F, Tempered 1050 F | 229 | 104,100 | 79,000 | 28 | ... | 67 |
| 2.0 | Quenched 1450 F, Tempered 1050 F | 241 | 106,100 | 99,500 | 27 | ... | 73 |

## 9% NICKEL STEEL

*continued from page 57*

with good welding and fabricating qualities, suggest the use of this steel as an alternate for non-ferrous alloys where strength is vital, and in place of stainless steel where corrosion resistance and purity of product are not overly critical.

### COST IS REASON FOR INTEREST

The primary reason for the strong interest in this metal is cost. Cryogenic vessels made of 9 percent nickel steel should prove less expensive to make than containers using non-ferrous materials. Data available suggests savings of 10 percent of final erected costs can be expected from advantages in welding and fabricating alone.

Low carbon 9 percent nickel steel offers economy in higher strength. This permits an allowable ASME working stress of 22,500 psi, third highest under present code provisions. High strength and excellent low temperature properties down to —320°F enable reductions in vessel weight, lower unit costs.

### HISTORY OF 9 PERCENT NICKEL STEEL

This steel was developed by International Nickel Co. almost 15 years ago. It is presently covered by ASTM Specification A353-58. Its minimum low-temperature impact value is covered under ASTM Specification A300, which requires a keyhole-notch impact value of 15 ft-lb at —320°F.

The steel, produced to the requirements of A353 and A300, can be used for vessels constructed under ASME Boiler and Pressure Vessel Code for service down to —320° F *if the vessels are stress relieved after fabrication.* About 200 vessels have been built of this steel for low-temperature service, starting in 1952 with a liquid oxygen unit. These vessels have been small enough so they could be stress-relieved in the shop after welding.

### LIMITED QUENCHING FACILITIES

At the time the steel was developed, commercial quenching facilities for plates were limited. Therefore, emphasis was placed on developing a steel in which good low-temperature properties could be developed by normalizing. The treatment specified under A353 involves two normalizing treatments: the first, from 1650° F, and the second, from 1450° F. To develop optimum low-temperature properties, still a third treatment, tempering at 1025° F to 1085° F, is required.

Since early development work, modern continuous heat-treating facilities have become available for the

## *Testing cylindrical vessels . . .*

The cylindrical vessel has hemispherical heads. The cylindrical part of the shell is 4 feet in diameter and 9 feet long. The vessel's overall length is 13 feet. It has a built-up manhole 16 inches diameter, also made of ⅜ inch plate. The flange and cover are made from 9 percent nickel steel forgings heat treated the same as the plate materials. The vessels were fabricated by manual metal-arc welding using Inco Weld "A" electrodes.

The vessels are cooled to —320° F by filling with liquid nitrogen. They are pressurized by high-pressure pumps until they fail by bursting.

Five of these vessels were tested. Two were made of quenched and tempered 9 percent nickel steel, three of double-normalized and tempered material. One of the quenched and tempered vessel and two of the double-normalized and tempered vessels were stress relieved according to the ASME Boiler and Pressure Vessel Code.

High burst stresses were attained. The highest was exhibited by the two as-welded vessels, that is, those that had not been stress relieved after fabrication. Each of these burst at about 136,000 psi. The burst stress for the stress-relieved vessel of the quenched and tempered material was slightly lower, about 130,000 psi. The lowest value obtained was that for one of the stress-relieved vessels of the double normalized and tempered material, about 93,000 psi. The second stress-relieved vessel of double-normalized and tempered material burst at about 128,000 psi. The burst stresses for all the vessels was at least four times the design stress of 22,500 psi for Grade A and 23,750 psi for Grade B material.

The fracture of the as-welded vessel of the quenched and tempered material started at about the midpoint of the longer of the two longitudinal weld seams. The fracture looks quite ductile and local reduction in thickness is quite apparent in the weld metal, especially at the starting point. When the fracture spread from the weld seam into the adjacent shell plate, the fracture was a 100 percent shear fracture. In the other vessels, the fractures started at points of high stress concentration near the manhole opening in the bottom of the vessel. The fracture appearance for the double-normalized and tempered as-welded vessel was predominantly shear. The fractures in the stress-relieved vessels showed evidence of cleavage fracture with varying percentages of shear fracture, although somewhat more cleavage fracture was observed in the double-normalized and tempered and stress-relieved vessels.

**BURST TEST** is made by filling vessel with liquid nitrogen at —320°F and pressurizing it by adding more liquid nitrogen. Vessel bursts but does not shatter under a load about six times the design stress. Tear is ductile.

production of quenched and tempered plates under uniform and closely controlled conditions. Because quenching and tempering is a considerably simpler heat-treatment than double normalizing and tempering, it was decided that the properties of 9 percent nickel steel in the quenched and tempered condition should be investigated.

### WELDING

Low carbon 9 percent nickel steel may be welded or flame cut without preheating, except under conditions of heavy restraint. Then it is preheated to 300° F.

This material has been readily welded with 25-20 Cr-Ni stainless electrode (Type 310 with 18,500 psi allowable stress). Results, however, did not permit the full use of the allowable strength values for the plate in low temperature design due to the lower tensile strength of the weld metal.

The best welding results (resistance to low temperature embrittlement and using maximum allowable design stress) have been obtained with coated electrodes for manual arc welding (Inco-Weld "A" with 22,500 psi allowable stress) or bare wire electrodes for inert-gas welding (Inco-Weld "A" wire).

Welding qualifications for pressure vessels are spelled out by the ASME Unfired Pressure Vessel Code, Section IX, P #10. Section VIII, UCS-56, requires welds be stress relieved at 1050° F. Pressure vessel welds are inspected radiographically under UCS-57.

### TESTING

Two kinds of vessels were tested. One was a cylindrical vessel similar to those used for storage and transportation of low temperature gases. The other was a rectangular vessel simulating those used on shipboard for transportation of liquefied gases.

They were made from ⅜ inch thick 9 percent nickel steel that was hot-rolled and heat-treated. Part of the material was double-normalized and tempered; the other part, quenched and tempered. The normalizing temperatures were 1650° F followed by 1450° F. Tempering was done at about 1100° F instead of the usual 1050° F. This improved notch toughness. For quenching and tempering the material was heated to 1475°. F and water quenched. The tempering treatment was 1100° F. For either treatment, the steel was water-quenched from the tempering temperature.

### TEST RESULTS

A complete description of how these tests were made and what resulted can be found at the bottom of this page and the bottom of page 58.

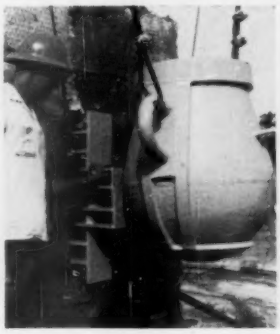
## *Testing a rectangular vessel . . .*

The two rectangular vessels tested are 8 feet square and 6½ feet high. They have flat shell plates with welded stiffeners. One was made of double-normalized and tempered material, the other of quenched and tempered material. Neither of the completed vessels was stress relieved.

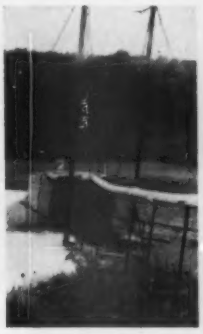
The purpose of the tests was to show the 9 percent nickel steels in this type of construction are capable of withstanding shock and have the ability to undergo extensive plastic deformation at —320° F under combined internal pressure and impact. A pendulum with a 4350-pound weight provides the impact. This weight can be released from heights as great as 19 feet, providing an impact energy of about 82,000 ft.-lb.

The vessel made of the quenched and tempered material was the first to be tested. It was struck several times with the 4350-pound ball with and without internal pressure. Failure finally occurred in one corner of the vessel as a result of bending stresses; a short crack about 8 inches long was opened. By this time, the vessel had undergone a total indentation between the front and back faces of about 2½ inches and a total bulging of the side faces of about 1½ inches, with extensive deformation of the stiffeners.

A similar sequence of blows was made in testing the second rectangular vessel, the one made of double-normalized and tempered material. The behavior of this vessel under test was similar to that of the first. Again, failure occurred in the corner as a result of bending stresses and considerable permanent deformation of the shell plates and stiffeners occurred.



**IMPACT TEST** is made by swinging a 4340-lb ball against the side of the vessel which is filled with liquid nitrogen at —320°F.



**WHEN VESSEL** finally ruptures, liquid nitrogen escapes. Engineer points out ductile rupture in vessel's corner.

# How Charles Houston helped

When you're grinding weld beads, a yard can seem like a mile if you're stuck with a second-rate grinding wheel. The bigger the job, the more important it is to have highly efficient wheels.

On one particular job, in fact, at Arduini Manufacturing Company in Worcester, Mass., the dimensions alone were enough to give a portable grinder operator nightmares. It was an enclosure for a Westinghouse turbine generator 85 feet long and 20 feet high. The welds were exceedingly long and heavy and had to be finished with expert care for one important reason: The entire 3/16" steel structure was due for only a single coat of paint!

As operator Amos "Mickey" Recore said: "It was kind of like being a Hollywood make-up artist trying to make the heads on Mount Rushmore look like human skin. And, brother, it seemed like there was about five hundred acres of welds to grind."

*Operator Amos Recore blends heavy weld bead on giant turbine generator enclosure using fast, reliable, Bay State Blue Flash hat wheel on high-speed, portable grinder. (Wheel guard has been removed for photography.)*

*Plant Superintendent Pierre Boutillette (right) and Grinding Department Foreman John Harrison (left) examine smooth, unblemished finish after weld bead has been ground with a Bay State Blue Flash hat wheel in the hands of a first-class operator.*

# smooth "acres of welds" at Arduini Manufacturing Company

Thanks to Charles Houston, Jr., of Bay State distributor Industrial Supplies, Inc., Recore had Bay State Blue Flash wheels to work with, and the job was done without gouging, burning or undue strain of any kind. To quote operator Recore again, "those Blue Flash wheels are the best I ever used."

Between the well-known Blue Flash series and the new Koolie Hat wheels, Bay State has answers for just about every type of weld-grinding problem in the book. For these and also for problems that are *not* in the book, call your Bay State distributor or direct representative. Better grinding at lower cost . . . that is his business.

As V. P. and Sales Manager of Bay State distributor Industrial Supplies, Inc., Worcester, Mass., Charles J. Houston, Jr., has an enviable record of experience in almost every phase of metal-working. With a solid business-school background on top of that, his technical knowledge is thoroughly supported by training in the problems of management. In other words, he knows his job is to help *you* make a profit. This is typical of *all* Bay State representatives.

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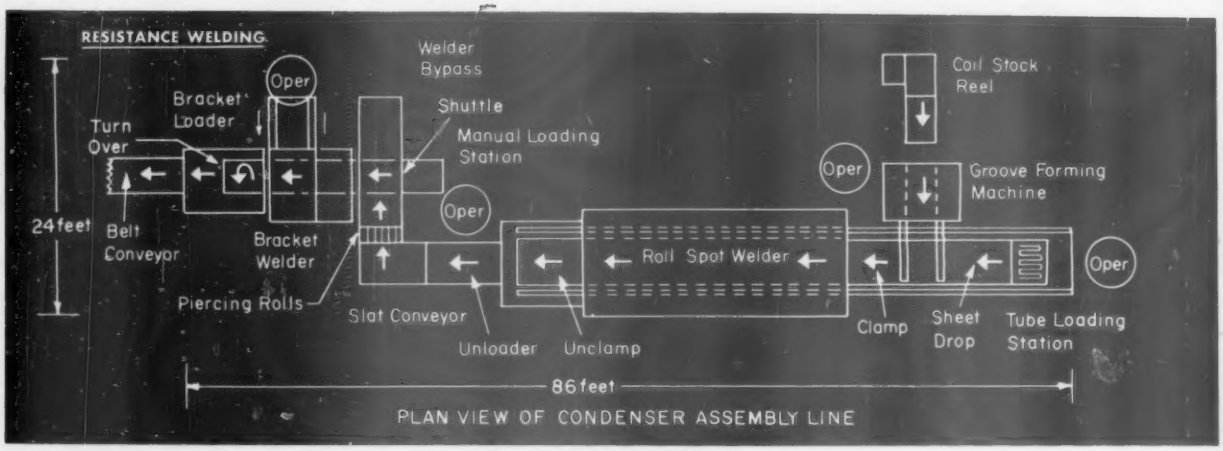



*one big advantage of resistance welding is that it can be done along with other metalworking operations in a single automatic line . . .*

1 Operator loads steel tube serpentine on conveyor fixture of roll spot welding machine.

# Automatic Line Combines Resistance Welding With Forming And Piercing

by **THOMAS C. FALTER,** *welding engineer, Frigidaire Division, General Motors Corporation, Dayton, Ohio*

**IN BRIEF: Here's how Frigidaire fabricates refrigerator condenser assemblies in one continuous automatic operation.**

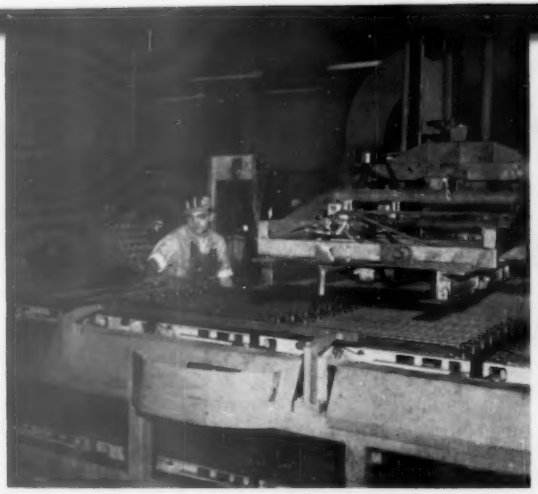
ONE BIG ADVANTAGE of resistance welding is that you can do it along with other metalworking operations in a single automatic line. Our refrigerator condenser assembly is a good example. We make these on two automatic lines that tie together roll spot and projection welding with forming and piercing operations. One line would produce enough, but we would have to run it two shifts. Producing seven different sizes of condensers demands change over time, calls for a second line so we can meet our production in one shift.

## DESIGNING AND DEVELOPING TOOLING

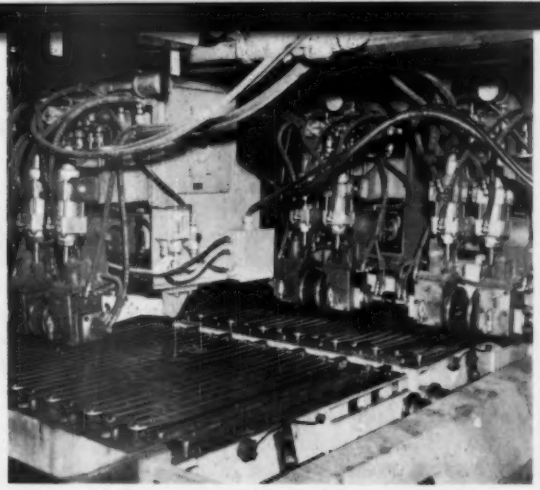
Our Process, Tool, and Welding Engineering Departments worked closely with our Product Engineering group. These departments did a great deal of experimental work before we bought any equipment. They designed and built a special dual-head roll spot welder. From it they got facts about weld schedules and minimum sheet thicknesses. They did a lot of planning of welding fixtures and fixture transfer methods. They also had to design and build experimental forming and piercing tools before buying the forming and piercing machines.

## HOW THE ASSEMBLY LINE WORKS

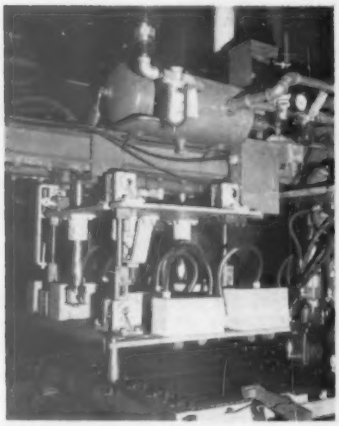
The operator loads a steel tube serpentine on the



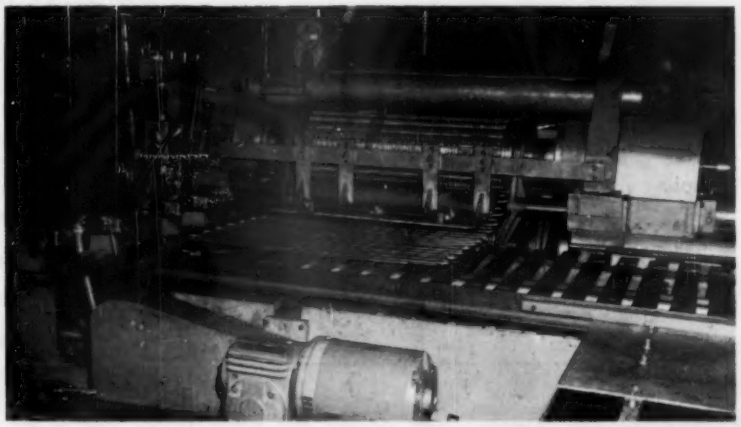
**2** Sheet forming machine has support frame that hangs over fixture conveyor and drops grooved sheets onto tubing.



**3** Roll spot welder has three dual heads. Machine's flat top has catwalk for servicing timers and ignition contactors.



**4** Automatic unloader removes assembly from spot welder.



**5** Condenser assembly enters piercing rolls in machine which pierces a series of oblong extended louvers in the sheets.

welding fixture. The fixture then moves under the unloading station of the forming machine. A grooved sheet drops on top of the tubing. The fixture then moves forward and clamps the parts automatically before they move through the welder. Here, the sheet is roll spot welded along the length of each tube pass. The welded subassembly is unclamped and unloaded automatically.

The unloader then drops the part on a conveyor. It carries the part to a piercing machine which pierces louvers in the sheet and automatically transfers the part to a shuttle. This carries the assembly through a second welder which projection welds two mounting brackets to the tubing. Then, an unloader removes the assembly, turns it over, and drops it on a conveyor.

### ROLL SPOT WELDER

Our roll spot welder has 34 welding fixtures for carrying steel tube serpentines through it. Endless chains one on either side of the fixtures, carry them through welding, down, under, back through the welder and back into the loading position.

The fixture is a rectangular magnesium casting. We make the lower welding electrodes of extruded copper and fasten them to the casting. Each electrode section is 27 inches long. Each has four semicircular grooves in its top surface to receive four tube passes.

Steel blocks inside the tube bend radius position the tubing. Steel blocks also locate the grooved sheets. At one edge, these blocks are fastened solidly to the fixture. At the other edge, they are attached to an adjustable arm, which moves them over and against the sheet. We can locate three different condenser widths and four different lengths. No fixture change is needed to run the different condenser lengths, but tubing and sheet locator blocks must be moved to accommodate different widths. Sets of tube locator blocks are provided for each size. They are mounted on hinged arms which permit their being retracted into the fixture by simply adjusting a screw. Sheet locating blocks are removed and remounted in another location.

### SHEET FORMING MACHINE

The 0.010 inch coiled low carbon steel is mounted on a stock reel drive and fed through two large diameter rollers. These form semicircular grooves that are accurately spaced to fit over the tubing

*continued on page* 64

## RESISTANCE WELDING

*continued from page 63*

passes. The sheet moves away from the rollers and is cut to correct length automatically.

The machine has a support frame that hangs over the fixture conveyor. The sheet drops from this support frame onto the tubing. An operator inspects the sheet and watches the operation of equipment at the front of the line. At this point, the parts are automatically clamped to the fixture.

### ROLL SPOT WELDING

The fixture moves through the roll spot welder at 16 fpm. Seam welding heads mounted to the upper frame roll spot weld the sheet to the length of the tube. Welds are at 7/16-inch intervals.

### SEAM WELDING HEADS

The seam welding heads are mounted two abreast. Each is equipped with a 75 KVA welding transformer and two seam welding wheel assemblies, arranged to provide a series weld circuit. The electrodes mounted on the fixture act as the current shunting member in the welding circuit. The wheels are spaced so each dual head welds alternate tube passes. For example, the first dual head welds the first and third tube passes. As the fixture progresses under the heads, the weld pattern is divided among the heads to hold sheet warpage to a minimum. The wheel assemblies are small because the weld force is only 275 pounds.

A spare welding head allows welding to continue if any of the 16 welding heads fails. Each head is mounted on jigs and can be moved to any position across the width of the machine by adjusting a screw. The head may also be adjusted outboard of the machine to permit repairs while welding continues.

### UNLOADING THE WELDER

The unloader moves downward to pick up the tube-and-sheet assembly as the fixture moves beneath it. Electromagnets mounted on equalizing rocker arms hold the assembly as it is pulled up off the fixture after automatic unclamping. The unloader, supported on an overhead rail, then moves away from the welder, lowers the assembly and drops it on a slat conveyor. This carries it through a straightener and on to the piercing machine.

### PIERCING

As the assembly hits a stop at the end of the slat conveyor, two sprocket wheels raise. These engage the tubing bends and drive the assembly between the rolls of the piercing machine where a series of oblong extruded louvers are pierced in the sheet between the tubes.

### TRANSFER MECHANISM

The transfer mechanism then moves the condenser to the final welding operation. As it moves away from the piercing machine, the tube-and-sheet assembly is supported by rails and driven by a series of wire wheels mounted above it. As the part nears the end of the transfer, the supporting rails swing away and drop it on an elevator. This moves downward and positions the assembly on the welder shuttle bars. If these bars have not returned to a position under the condenser, the assembly continues to the end of the transfer and is dropped onto a table for manual loading later on.

### PROJECTION WELDING

The condenser is shuttled into the final assembly welder. Two condenser support brackets are automatically loaded and positioned in welder. A crosswire-type projection weld is formed by a single elongated projection that runs the length of the support bracket and the steel condenser tubing.

The welder has four 100 KVA welding transformers and 16 air-operated press-type welding heads. All welds are made using series circuit. Each head supplies force for four crosswire welds. The loaders have air-operated arms with permanent magnets to pick up the brackets and put them in loading position where chain-driven fingers push them onto the lower electrodes of the welder. Air-operated clamps hold the brackets against the electrodes until the weld cycle is completed.

After welding, the shuttle deposits the completed condenser-and-bracket assembly on a fixture. This turns the assembly over and deposits it on a belt conveyor which carries it to tube-forming and leak-testing stations. • •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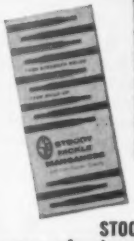

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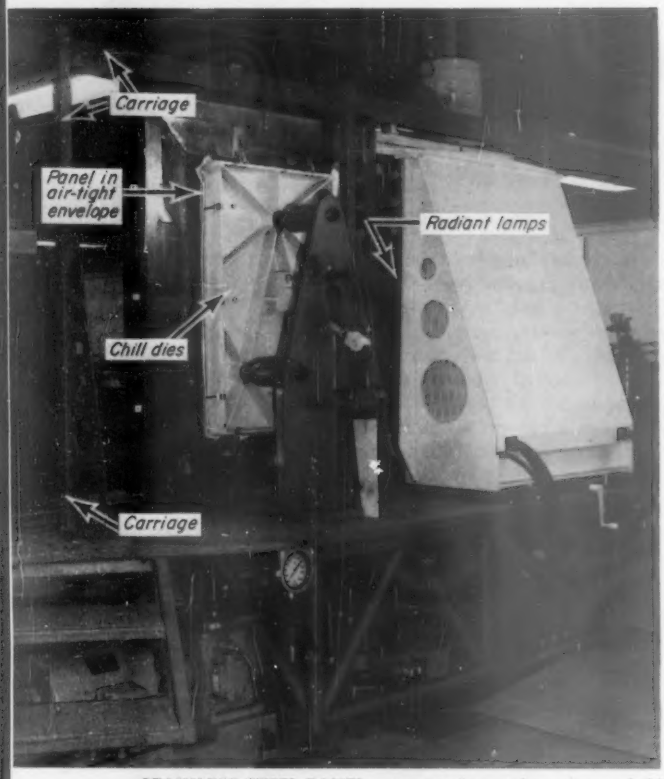
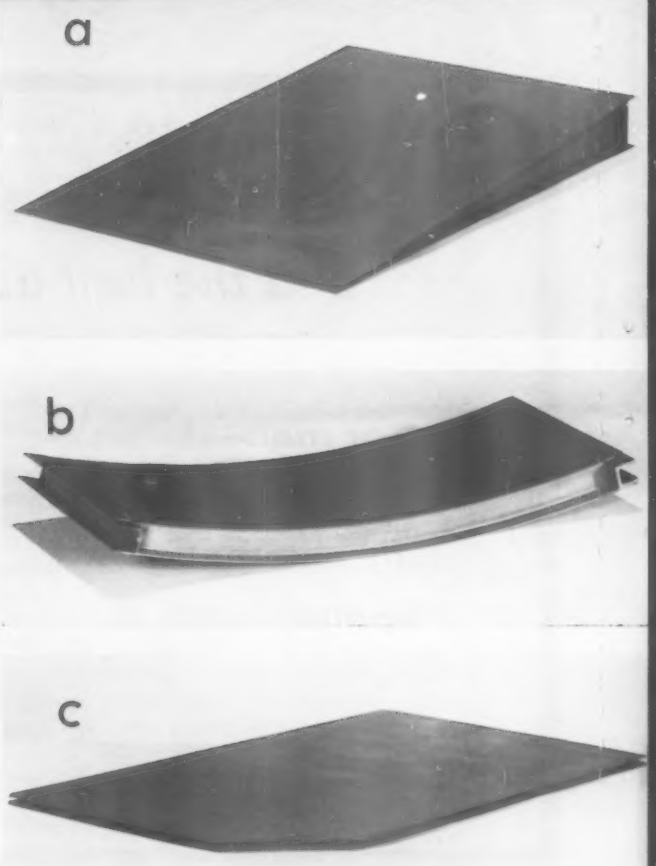



**STAINLESS STEEL PANEL** in its airtight metal envelope is held in chill position. The part has just moved from between the banks of radiant brazing lamps at right. Moving the part from the braze position to the chill position takes only 1¼ seconds. Carriage frame is covered with gold-fired shield to prevent overheating.




**THESE TYPICAL** 22-by-34 inch panels were made by the Nortobraze process. Wedge-shaped panel (A) tapers from 3-inches to ½-inch and contains these inclusions: tapered bar and C- and Z-shaped edge members. Contoured panel (B) has edge members of varying thicknesses. Flat panel (C) is typical of those brazed successfully by the new process.

# Northrop Brazes Honeycomb Panels

**IN BRIEF: Northrop thinks its new process could replace the 3-to-15 hour furnace brazing methods used for making honeycomb panels from stainless, titanium, columbium, and molybdenum.**

LESS THAN 15 MINUTES! That's how long it now takes Northrop Corp. to braze honeycomb sandwich panels. Furnace brazing takes from 3 to 12 hours.

A new process, called Nortobraze, uses heat from banks of radiant quartz lamps. It was developed by Northrop's Norair Division, Hawthorne, California, for brazing panels for high-performance aircraft and space vehicles.

### ADVANTAGES OF THE NEW SYSTEM

Nortobraze brazes a panel in from 2 to 15 minutes, depending on the shape and complexity of the panel. It brazes stainless steel and other high-temperature metals, including alloys of titanium, columbian, and molybdenum.

The process provides precise, localized temperature control. Thermocouple feedback from the honeycomb panel and electronically-controlled temperature selectivity in the lamp banks provides uniform heating and cool-down throughout the panel. This is in spite of varying core thicknesses or solid metal inclusions which have different heat-sink rates.

The panels are brazed inside envelopes made of soft auto body steel. These envelopes are airtight so panels can be stored in them under light argon pressure, then brazed speedily, one after another.

### BRAZING EQUIPMENT

The brazing machine consists of two major elements:

Opposing banks of quartz lamps give heat up to 6,000°F. These have a possible total output of 200,-

**Ten Steps In Nortobrazing**

- The brazing envelope is stamped from auto body steel to fit the shape of the honeycomb panel.
- The sandwich is formed with brazing alloy between the core and the panel skin. The envelope sheets are placed on both sides of the panel. Vacuum and argon hose fittings are added.
- The envelope's edges are roll-seamed and welded to form a gas-tight brazing package. The envelope holds the sandwich parts in place.
- The envelope is covered with heat-absorbing paint.
- Argon and vacuum hoses are connected. The envelope is then hooked on the brazing machine. Fired ceramic gold panels protect the carriage frame from heat.
- Air is withdrawn and argon is put in. A vacuum of 500 millimeters absolute is established.
- The panel is raised rapidly to the brazing temperature.
- When the brazing cycle is completed, the envelope is automatically transferred to the chill dies. It is clamped until the panel temperature has dropped to where the shape won't change.
- The envelope is removed from the machine for heat treating.
- After heat treating, the envelope is opened. Completed honeycomb sandwich panel is removed.

# In 15 Minutes

000 watts per square foot of honeycomb panel. (Only one-quarter of that is used for present jobs.)

Opposing chill dies clamp the panel for cooling. They have channels for circulating cooling water, although normal heat radiation from the die mass is sufficient for most cooling operations.

**THERE ARE TWO GROUPS OF CONTROLS**

One control console automatically purges air from the brazing envelope and introduces argon. It also controls the hydraulically-operated carriage that rides single top and bottom rails and holds and positions parts between the lamp banks or the chill forms.

The other control is a 6-channel power control that regulates the time and temperature sequencing of the brazing cycle. Scanners follow a graph to control the heat responses. Manual controls are also provided. Strip chart recorders keep a complete record of temperatures in each zone of the panel being brazed. • •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RECLAIM
REBUILD
*and*
SALVAGE
*1001 METAL PARTS*

*by spraying* carbon and stainless steels, babbitts, bronze, nickel, brass, tin, aluminum, zinc; hard ceramic facings.

TURBO-JET with new MAGNETIC AIR CONTROL sprays wires or rods.

•

POWDER-JET GUNS spray ceramic and metal powders *from any angle.*

A TINY FRACTION of the REPLACEMENT COST *gives new service-life* to WORN OR BROKEN PARTS . . . *salvages* MIS-MACHINED PARTS for even the biggest, heaviest installations such as: hydro-electric turbine shafts, pump shaft sleeves, etc. *And more* . . . PRODUCTION SPRAYING for manufacturers improves wear resistance, prevents corrosion, provides smooth surface for baked finish, etc.

ADD MOGUL HIGH-PROFIT, LOW-COST EQUIPMENT THAT PAYS FOR ITSELF IN PROFITS!

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For More Information Circle No. 58 on Reader Service Card.

WELD WITH Tipaloy

YOUR Resistance Welding Electrode NEEDS Are OUR Business!

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ROD or BAR:
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HOLDERS:
ADAPTERS:

SPECIAL WELDING DIES or FIXTURES: TIPALOY *has them.*

BUY TIPALOY and save money!

TIPALOY can supply you with:
RWMA Class #1, Tipaloy #100
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RWMA Class #3, Tipaloy #200
and other RWMA classes of alloys to fit your needs.

It is unwise to pay too much, but it is worse to pay too little!

Use TIPALOY and get 30% to 100% more performance for your money than you are now getting.

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Send your trial order today

*TIPALOY #130 cast and processed under our patents.

FREE: Write for your copy of Tipaloy's comprehensive new catalog.

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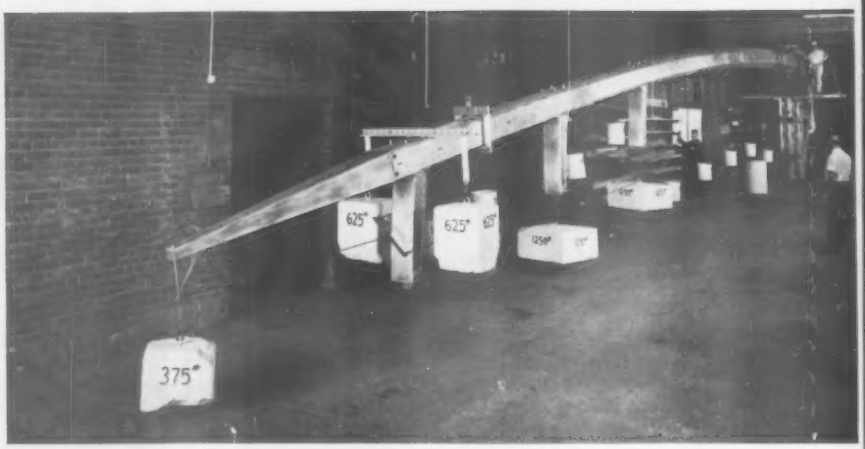
REPRESENTATIVES IN PRINCIPAL CITIES
Tipaloy INC. | 1435 E. MILWAUKEE AVE. DETROIT 11, MICHIGAN

Circle No. 76 on Reader Service Card.






*tests equivalent to* 140 *mph winds prove that this . . .*

# Welded aluminum transmission tower withstands hurricane-force winds

IN BRIEF: New tapered octagonal construction uses extruded shapes to reduce weight of 85-foot electrical transmission tower.

A WELDED ALUMINUM power transmission pole will withstand hurricane forces. Yet it weighs 70 percent less than a steel pole and 90 percent less than one of concrete.

The pole is the latest development of the Alrectic Division of McGraw-Edison Company, Jackson, Mich. It is a companion to the welded aluminum lattice pole featured on pages 86-87 in the April, 1960, WELDING DESIGN & FABRICATION.

## DESIGN CONSIDERATIONS

The new pole will carry a 110-kv transmission line. Average span will be 600 feet.

The pole is octagonal and in one piece. Including its three 7-foot crossarms, it weighs 2,400 pounds. It is 85 feet long, 2 feet wide at the base. The main structural members are made of two sizes of extruded shapes (called chords) to reduce weight. The pole is tapered. It is stiffened with plates welded to opposite chords. Because the pole is almost completely welded, there is none of the slippage sometimes found in bolted poles. The only bolting used is done in the field. It connects the crossarms to the pole and the pole to the concrete foundation.

## STATIC LOADING TESTS

The lab bolted the pole horizontally at one end. Then they hung 4,525 pounds of weights from the crossarms and from points along the pole. These represented wind loads on the pole and crossarms while supporting three 1.28-inch ASCR conductors and a 3/8-inch high-strength static wire. The testers, at the same time, applied loads of 5,985 pounds through dynamometers. These loads represented the dead weight of the pole and the three conductors.

Under loads equivalent to 140-mph winds, the welded pole deflected 81-inches without a single member or weldment failing. The pole returned to horizontaol when the loads were removed. This strength is 12 percent greater than National Electrical Manufacturer's Association standards. • •

***new techniques for welding aluminum are featured in our January issue***

## Save Time, Money, Labor

find cracked parts quickly, easily, with

MAGNAFLUX

# Spotcheck®

DYE PENETRANT INSPECTION

**NOW—** Fire-Safe **MATERIALS** at same low prices

**HERE'S WHY**

Cracks, pores and defects open to the surface can cause rejects or failure in service. In parts or machinery this can mean costly repairs, prolonged downtime, extensive damage, even loss of life! Cracks can be eliminated thru inspection at any stage in manufacture, — or during maintenance overhaul.

**HERE'S HOW**

Inspect with easy-to-use Spotcheck. Dye penetrant inspection becomes as simple as pushing a button. All materials available in spray can and Fire-Safe—cleaner-dye remover, penetrant, developer. Defects are clearly defined as bright red marks against the white of the developer. Works on any solid material! Bulk materials also available, up to 55 gallon drums.

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Everything you need in handy, rugged steel carrying case. 2 spray cans Penetrant, 2 spray cans Developer, 4 spray cans Cleaner-Dye Remover, instruction book, cleaning cloth, wire brush. ORDER FROM YOUR DISTRIBUTOR, OR DIRECT!

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# Control The Flow Of Brazing Alloys

Limit the flow of brazing alloys to the joint area with just a simple brush stroke of **Nicrobraz Green Stop-Off.** It effectively stops the flow of any brazing alloy, using either torch or furnace methods.

For protecting areas inaccessible after joining, use **Nicrobraz Red Stop-Off;** it leaves a completely soluble residue. **Nicrobraz White Stop-Off** applied to mating or stacked parts will prevent their sticking together during furnace processing.

**Other NICROBRAZ products include: cement, for mixing with powdered brazing filler metals, and fluxes for easier brazing. Write for new data sheets today.**

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*Stainless Processing Division*

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HARD-SURFACING & BRAZING ALLOYS





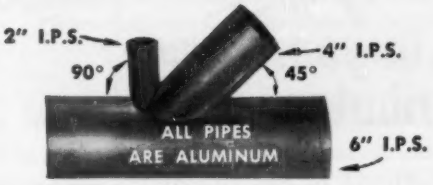
# CAN YOU — IN YOUR SHOP — MAKE UP A WELD JOINT?

*In less than 2 minutes?*

# CAN YOU THEN WITH NO DIE CHANGE MAKE THIS SET-UP?...

*. . . and have both done in less than 4 minutes?*

# HOW WOULD YOU MAKE THIS ONE?




**You could have made all 3 joints shown in *less than 15 minutes* with your**

## "De Witt Weld Joint Making Unit"!

**You should have one! Investigate! "How simple!" one customer said.**

**Ask for Ed De Witt**

**Phone me today! Call me collect! BUCKINGHAM 1-7000**

My job is to make your job of weld joint preparation easier.

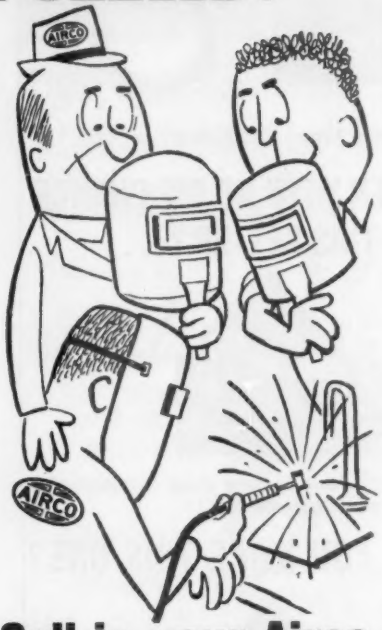
Or . . . write for a sample. (Tell me what joints you make)

# WALLACE

***SUPPLIES MFG. COMPANY***

**1306 W. Diversey Parkway • Chicago 14, Illinois**

# WELDING JOB GOT YOU PUZZLED?




## Call in your Airco Distributor...

Expert on oxyacetylene welding, stick electrode or gas shielded arc welding

Some of today's welding jobs are pretty tricky. When one of these jobs just won't go right, call in your Airco Distributor. Chances are that he or one of his salesmen has handled a job much like it. He can help you. Because he knows all the practical ins and outs of welding and he is backed by Airco's unexcelled experience.

For the equipment you need, choose from the **AIRCO** quality line of gas welding and cutting equipment – arc welding equipment and arc welders – gas-shielded arc welding process equipment – flame cutting machines – high purity and rare industrial gases – electrodes – supplies and accessories.

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**Circle No. 2 on Reader Service Card.**


# REFERENCE DATA *catalogs, handbooks, manuals*

**HOISTS,** trolleys, and cranes are described and illustrated in 8-page Bulletin DH-28A from the Wright Hoist Division of American Chain & Cable Company, Inc. The bulletin contains data on general features of all units, including weights, dimensions, and capacities.

**For More Information Circle No. 300 on Reader Service Card.**

**A NEW LINE** of two wheel industrial hand trucks just introduced by Harper Trucks, Inc., is featured in a 4-page bulletin. Specifications are given for conventional trucks (for boxes, cartons, and packages) and for special trucks (for barrels and reels).

**For More Information Circle No. 301 on Reader Service Card.**

**A LINK** between conventional arc welding and spot welding is featured in a 4-page brochure from No-Arc Equipment Co. Described and illustrated is the company's No-Arc Quick Weld gun that spot welds from one side. Design details and operating characteristics are given.

**For More Information Circle No. 302 on Reader Service Card.**

**NINE ALLOYS** that resist wear and corrosion are described in a 20-page bulletin published by Ampco Metal, Inc. "Ampco Alloy Specifications" includes chemical compositions, physical properties, and principal uses of a series of copper-base alloys.

**For More Information Circle No. 303 on Reader Service Card.**

**TRANSFORMERS** for resistance welding are the subject of Bulletin T60-1 issued by Kirkhof Mfg. Corp. The 8-page bulletin explains in detail how the company's Epoxy-Pak line provides up to 33% greater KVA capacity, better overload protection, and longer weld cycles and operating life.

**For More Information Circle No. 304 on Reader Service Card.**

**PRECISION WELDING** equipment is featured in a catalog available from Weldmatic Division of Unitek Corporation. The 24-page catalog describes and illustrates a complete line of stored-energy, capacitor-discharge power supplies, precision welding heads and handpieces, and welding accessories.

**For More Information Circle No. 305 on Reader Service Card.**

**AC WELDERS** and their specifications and operating characteristics are the subject of two bulletins available from National Cylinder Gas Division of Chemetron Corporation. Bulletin NH-175 features 180-amp welders. Bulletin NH-178 features 295-amp welders.

**For More Information Circle No. 306 on Reader Service Card.**

**PIPE WELDING** information can be found in a 72-page pipe fitters manual available from Tube Turns Division of Chemetron Corp. Text, tables, and illustrations give mathematical, physical, chemical and metallurgical data. Information is also included on design and layout.

**For More Information Circle No. 307 on Reader Service Card.**

**ABRASIVE CUTTING MACHINES** manufactured by the Abrasive Machine Division, Beaver Pipe Tools, Inc., are featured in a comprehensive 8-page brochure. Eight different models are described and illustrated. Specifications are given for each and a complete line of accessories is featured.

**For More Information Circle No. 308 on Reader Service Card.**

**SINGLE-SOURCE SERVICE** for welded fabrications is explained in a brochure from R. C. Mahon's Steel-Weld Division. Described in detail and illustrated are the company's extensive facilities (welding, machining, and assembling) for making strong, high quality, attractive weldments.

**Circle No. 309 on Reader Service Card.**

**SHEARS** for cutting wire rope, flats, rounds, and angle irons are featured in literature from the Edwards Mfg. Co. Specifications are given and different cutting techniques are compared.

**Circle No. 310 on Reader Service Card.**

**TITANIUM** is featured in Bulletin No. 100 published by the Nooter Corporation. "Titanium Facts" contains charts giving code designations, metallurgical properties and other technical data on various titanium alloys. Welding techniques are explained.

**Circle No. 311 on Reader Service Card.**

**PRESS BRAKES** of the straight-side-type are described and illustrated in a bulletin available from Dreis & Krump Mfg. Co. Bulletin SS-60 describes construction features and gives general specifications.

**Circle No. 312 on Reader Service Card.**

**SEAMLESS PIPE AND TUBING** for high temperature service are the subject of a 6-page folder published by the Tubular Products Division of The Babcock & Wilcox Company. Folder T-467 lists the properties of 15 different Croloy steels.

**Circle No. 313 on Reader Service Card.**

**RESISTANCE WELDERS** are described and illustrated in a 12-page brochure issued by The Federal Machine and Welder Company. Bulletin BT-60 covers standard equipment and automated machines.

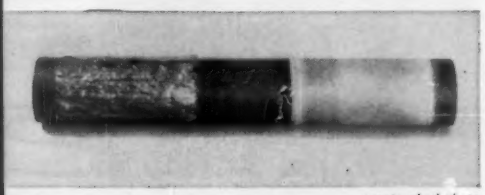
**Circle No. 314 on Reader Service Card.**

**ROUTERS** for sheet metal fabricators working in non-ferrous metals are described and illustrated in literature from Ekstrom, Carlson & Co.

**Circle No. 315 on Reader Service Card.**


# HARD FACING TIME CUT FROM 4 HOURS TO 25 MINUTES

**The two end sections of this shaft have been built up with AMS 4775. Section at left applied by welding – time 4 hours; section at right by flame spraying – time 24 minutes, 45 seconds.**

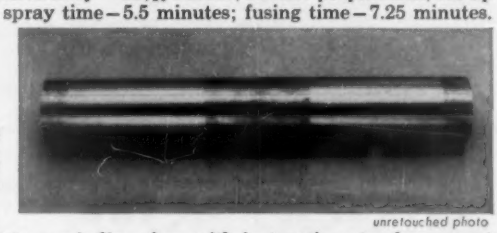


unretouched photo

**QUESTION: And which end would you prefer to grind finish?**

Here's the whole story. We took a 15" length of 2.5" mild steel shafting and undercut two 5" sections .050" on the radius. We then sent the shaft to a nationally-known job shop with instructions to apply AMS 4775 on the left-hand section, sufficient to finish at 2.5". Weight of welded-on alloy was 17 9/16 ounces – time spent by one of their top men – 4 hours (including preparation).

Then we blasted the second section with steel grit and flame sprayed it with AMS 4775 in powder form (ThermoSpray Powder 15E). The coating was then torch-fused. Weight of deposited alloy – 11 5/16 ounces; surface preparation, set-up and pre-heat – 12 minutes; spray time – 5.5 minutes; fusing time – 7.25 minutes.



**Finish-ground shaft – welded section at left, flame sprayed section at right.**

unretouched photo

We then sent the shaft out to a grinding shop with instructions to clean up at 2.500" plus. The flame-sprayed section cleaned up at 2.510" but welded section still showed pits when grinding was stopped at 2.477" (see photos below left). Rockwell of welded end Rc-61, sprayed end Rc-60.

**Note pits in welded section at left. Both magnified about 50x.**

These flame-sprayed coatings are solid, homogeneous; usually superior to those applied by other methods. You can apply them at high speed, with lower material and finishing costs. In addition to AMS 4775, a number of other powders – including tungsten carbides – are available for various service requirements; all may be fused–some used as sprayed for certain service requirements.

**For further information on this high-speed, money-saving, hard-facing process, phone, write or wire.**

**Pump plunger being flame sprayed with METCO ThermoSpray Powder Gun**

METCO INC.
FORMERLY METALLIZING ENGINEERING CO., INC.
*Flame Spray Equipment and Supplies*

1179 Prospect Ave., Westbury, L. I., N. Y. Telephone: Edgewood 4-1300 Cable: METCO
In Great Britain: METALLIZING EQUIPMENT CO., Ltd., Chobham-near-Woking, England

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**For More Information Circle No. 59 on Reader Service Card.**

For More Information Circle No. 4 on Reader Service Card.

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TO THE RESCUE
HMMMMM — SPOT WELDMENTS LIKE PERFORATED PAPER. THAT'S NEW!
BURN-THROUGH! WARPING! ALL KINDS O' TROUBLE, DOC! WHAT'M I GONNA DO?
NOW YOU JUST FOLLOW THOSE TUFFALOY CATALOG SUGGESTIONS, AND YOU'LL SEE A REAL IMPROVEMENT!
TUFFALOY COLD FORMED TIPS do a better job than forged or cast tips. But you weld better with any electrode when you follow the suggestions in the Tuffaloy catalog. It has information on tips, shanks, holders, bar stock, accessories and prices. Call your Airco or Tuffaloy office.
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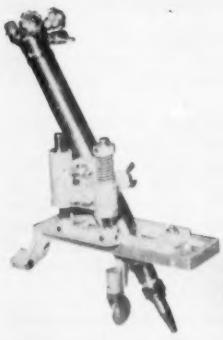
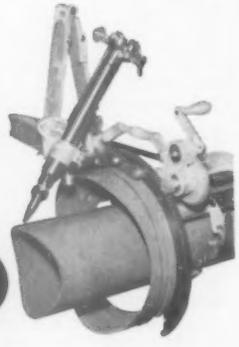
A division of Air Reduction Company, Incorporated
150 East 42nd Street, New York 17, N. Y.
Air Reduction Pacific Company; Air Reduction Canada Limited

Patent No. 2,843,373 — Patent applied for

make the TOUGH JOBS EASY with H&M





**H&M OUT-OF-ROUND for imperfect pipe** Features a free-wheeling roller assembly that swivels a full 360° — rides the pipe surface and is controlled by a unique spring tension that makes corrections for any eccentricities — eliminates inaccurate cuts and bevels.

**H&M SHAPE CUTTER for intersectional cutting** Cut saddles and miters for the fabrication of tees, els and other irregular designs simply, easily with the H&M Shape Cutter. The machine uses pattern templets to insure accurate cutting and produce precision design work.

**The Shape Cutter and Out-of-Round are available in a full range of sizes to fit all H&M Pipe Cutting and Beveling Machines. Write for catalog sheets on the complete H&M line, Today!**

H&M PIPE BEVELING MACHINE COMPANY
311 E. Third St. DI 3-0241
TM Reg TULSA, OKLAHOMA

For More Information Circle No. 35 on Reader Service Card.


## USEFUL LITERATURE *continued*

**AUTOMATIC** wire straightening and cut-off machines are the subject of 4-page Bulletin 2-A issued by the G. C. Patterson Co. These electrically-operated machines have variable speed drives from 70 to 200 fpm.

**Circle No. 316 on Reader Service Card.**

**BAND SAW MACHINES** and how they are used is the subject of an 8-page catalog from DoAll Company. The catalog gives applications, design details, specifications, and attachments used on the company's Zephyr line.

**Circle No. 317 on Reader Service Card.**

**THERMIT WELDING** of reinforcing steel for heavy concrete construction is described in a new data sheet from Thermex Metallurgical, Inc. Complete information is given on a new process developed for this task.

**Circle No. 318 on Reader Service Card.**

**A COMBINATION** finishing machine is featured in 4-page Bulletin WT-79 from Rockwell Mfg. Co. Explained in detail is how 4-inch abrasive belt and 12-inch abrasive disc can be used for 90 percent of all shop finishing jobs.

**Circle No. 319 on Reader Service Card.**

**WELDING FITTINGS** are the subject of 32-page Catalog No. 599 issued by B. K. L. Alloys Ltd. The catalog lists all standard and many special-purpose welding fittings. Material and service specifications are given.

**Circle No. 320 on Reader Service Card.**

**REGULATORS** and portable manifolds are the subject of a 16-page catalog prepared by Linde Company, Division of Union Carbide Corporation. Comprehensive Form 55-085 includes descriptions, specifications, and recommended uses.

**Circle No. 321 on Reader Service Card.**

**JIB CRANES** of 8 different types are described and illustrated in an 8-page brochure by Abell-Howe Co. Specifications and capacities are given for each.

**Circle No. 322 on Reader Service Card.**

**POWER TOOLS** and equipment for cutting rods, bars, wires, flat bars, and strip stock are described and illustrated in Form 900 issued by H. K. Porter, Inc. Featured in the 8-page brochure are portable and stationary hydraulic and pneumatic equipment.

**Circle No. 323 on Reader Service Card.**

**HOISTS AND CRANES** made by Robbins & Myers, Inc., are the subject of Folder 3547. Condensed specifications are given for five different hoists and three different cranes.

**Circle No. 324 on Reader Service Card.**

**METAL CUTTING** tools are described in Bulletin 779 from H. K. Porter, Inc. Specifications and design details are given for hand tools that can be used on all shapes and sizes of all metals.

**Circle No. 325 on Reader Service Card.**

**WELDING OF STAINLESS** steels is explained in a comprehensive catalog available from the McKay Company. Printed in 2 colors, in 8½ by 11 size, this manual discusses the stainless steels in use today and tells what welding procedures and welding electrodes should be used on each.

**Circle No. 326 on Reader Service Card.**

**50 AIDS** to welding training are listed and described in a new folder by Hobart Brothers Co. Listings include books, charts, films, and welding codes and specifications.

**Circle No. 327 on Reader Service Card.**

**AUTOMATIC FUSION WELDING** equipment made by Sciaky Bros., Inc., is featured in an illustrated 27-page report. Case histories explain how this equipment is being used to fabricate airplanes and missiles.

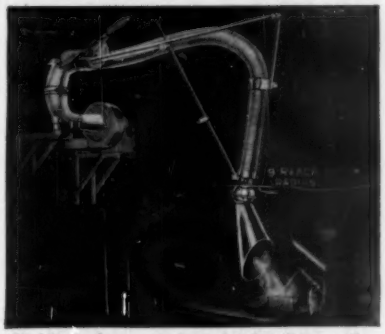
**Circle No. 328 on Reader Service Card.**

**BAND SAWS** sold by W. Whitney Stueck, Inc., are the subject of a 4-page illustrated brochure. General specifications, speeds, and optional features and equipment are listed for four different models.

**Circle No. 329 on Reader Service Card.**


**Circle No. 65 on Reader Service Card.**

## Remove Welding Fumes at the Source... with RUEMELIN FUME COLLECTOR



**Welding shops equipped with Ruemelin Fume Collectors are assured of a clean shop atmosphere. Noxious fumes, heat and smoke are eliminated AT THEIR SOURCE. Improves working conditions . . . lessens fatigue . . . paves the way for increased plant production. Especially helpful in winter months when windows and doors are closed.**

**Note the new spring-loaded counterbalance mechanism which makes Fume Collectors much easier to handle.**

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*Mfrs. & Engineers • Sand Blast & Dust Collecting Equipment*

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## Tips of the Trade from Blackhawk

Send today for your free copy of "Hydraulic Tool Ideas" — Blackhawk's colorful new how-to-do-it booklet for welding and fabricating. It's jam-packed with time-saving, cost-cutting ideas you can use right now! Ideas like these . . .

- **What to do when a production run is too small for press brake tooling, too big for "bellows and anvil" methods;**
- **How to solve that ever-present problem of heat distortion after welding;**
- **How to fitup heavy metal components for tacking;**
- **How to design your own low-cost fixtures for welding complex assemblies.**

**For your complimentary copy of this valuable booklet, just send a postcard or the coupon to Blackhawk Industrial Division, Dept. WD, Butler, Wisconsin.**

**BLACKHAWK INDUSTRIAL DIVISION**

**BLACKHAWK® MFG. CO.**

**Yes, Blackhawk!**

**RUSH my free copy of "Hydraulic Tool Ideas"!**

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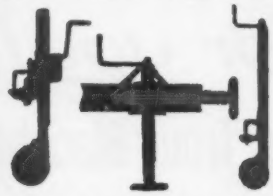
**For More Information Circle No. 18 on Reader Service Card.**

a constant source of business for you . . .

**A complete line of - Axle Assemblies, Trailer Undercarriages, Farm & Trailer Jacks, Implement & Trailer Couplers, Spindle End Assemblies**

**BULL DOG AXLE ASSEMBLIES**

**BULL DOG JACKS**



**BULL DOG COUPLERS**

**A COMPLETE LINE OF COUPLERS**

**SPINDLE END ASSEMBLIES**

Complete Spindle End Assemblies for 2,500, 4,000 and 5,000 lb. capacities Per Pair. Available in complete assemblies or individual parts — Spindle Ends, Hubs, Wheels.

*Contact* our engineering department for full details on your particular application — a FREE service to you — write for Catalog 18-S

NEVER LETS GO

**HAMMER BLOW TOOL CO.**

WAUSAU • WISCONSIN

**Circle No. 36 on Reader Service Card.**


**USEFUL LITERATURE** *continued*

**FLASH BUTT WELDERS** are featured in Bulletin 7-213A from Taylor-Winfield Corp. Capacities, electrical and mechanical specifications, controls, clamping fixtures, electrodes, backups, and weld upsetting mechanisms are explained in detail.

**Circle No. 330 on Reader Service Card.**

**3-PHASE INPUT** AC-DC welding with the new Controlarc line of arc welders is explained in literature from the Electric Products Division, Vickers, Inc. Bulletin 7206-3 explains the combining of the advantages of three-phase rectifier-type welders with AC-DC output.

**Circle No. 77 on Reader Service Card.**

**PORTABLE AIR HOISTS** are featured in a folder from Thor Power Tool Co. Specifications and lifting and lowering rates are given for each model. Cutaway views show hoist construction.

**Circle No. 332 on Reader Service Card.**

**WELDING HELMETS** are featured in Bulletin No. 21 from Flood Safety Products Co. Described and illustrated is a complete line of fiberglass and vulcanized fiber helmets equipped with Fit-Rite headgear.

**Circle No. 333 on Reader Service Card.**

**WELDED STEEL TUBING** is described and illustrated in a folder available from Armco Steel Corporation. Folder P. O. 6579 explains how five different types of tubing are made available as fabricated or semi-fabricated items.

**Circle No. 334 on Reader Service Card.**

**TRAVELING CRANES** and hoists are featured in a Catalog 795 from Detroit Hoist and Machine Co. Specifications and operating characteristics are given for many styles of hoists and cranes.

**Circle No. 335 on Reader Service Card.**

**PORTABLE NIBBLERS** and how to use them on a variety of metals, sizes, and shapes are explained


**NEW! WYPO FILE FREE!**

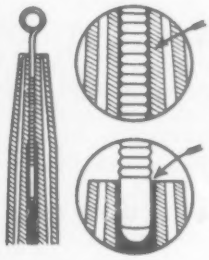
NEW POLISHED ALUMINUM CASE DESIGNED TO SERVE AS HANDLE FOR THE NEW FILE

*Let Your Local Welding Supply Dealer Explain Why "YOU GET SO MUCH MORE" With . . .*

**WYPO**
Wipes and Polishes *the World's Finest* CUTTING & WELDING TIP CLEANERS

***FREE! NEW, SPECIALLY DESIGNED WYPO POLISHING FILE INCLUDED IN EACH SET***

**More Exclusive WYPO Features**



These rounded outer edges of cleaning ridges clean and polish tip orifice without scratching or cutting.

This smooth pilot guides WYPO Tip Cleaner into tip. Will not enlarge or damage tip port.

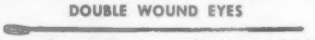
This cross section view of WYPO Cleaning Surfaces shows these exclusive features: Rounded cleaning surfaces that won't jam or cut.

Straight sided valleys insure thorough cleaning by removing all waste.

**SPRING LOADED SPOOL**

Spring loaded brass spool. Will not rust. Holds cleaners securely in case.

**DOUBLE WOUND EYES**



Insures longer life for small sizes of WYPO Tip Cleaners. Will not pull out of case.

**STAINLESS STEEL POLISHING FILE**

Specially designed WYPO File furnished free in each set

**NOW AVAILABLE IN 3 CONVENIENT SETS**

**WYPO TIP CLEANERS**
**STANDARD SET**

| CLEANER NO. | FOR DRILL |
|---|---|
| 7 | 75-74 |
| 8 | 73-72-71 |
| 10 | 70-69-68 |
| 12 | 67-66-65 |
| 14 | 64-63-62 |
| 15 | 61-60 |
| 16 | 59-58 |
| 17 | 57 |
| 18 | 56 |
| 22 | 55-54 |
| 24 | 53-52 |
| 26 | 51-50-49 |

S. S. WYPO FILE MADE IN U.S.A. PAT. NOS. 2429581, 2473758 IN CANADA 1948

STANDARD SET OF (12) Cleans (27) Drill Sizes Nos. 75 to 49 Incl.

**WYPO TIP CLEANERS**
**JUMBO SET**

| CLEANER NO. | FOR DRILL |
|---|---|
| 28 | 48-47 |
| 30 | 46-45 |
| 32 | 44-43 |
| 34 | 42-41 |
| 37 | 40-39-38 |
| 39 | 37-36 |
| 42 | 35-34-33 |
| 44 | 32-31 |
| 45 | 30 |

S. S. WYPO FILE MADE IN U.S.A. PAT. NOS. 2429581, 2473758 IN CANADA 1948

JUMBO SET OF (9) Cleans (19) Drill Sizes Nos. 48 to 30 Incl.

**MASTER SET**

| CLEANER NO. | FOR DRILL |
|---|---|
| 7 | 75-74 |
| 8 | 73-72-71 |
| 10 | 70-69-68 |
| 12 | 67-66-65 |
| 14 | 64-63-62 |
| 15 | 61-60 |
| 16 | 59-58 |
| 17 | 57 |
| 18 | 56 |
| 22 | 55-54 |
| 24 | 53-52 |
| 26 | 51-50-49 |
| 28 | 48-47 |
| 30 | 46-45 |
| 32 | 44-43 |
| 34 | 42-41 |
| 37 | 40-39-38 |
| 39 | 37-36 |
| 42 | 35-34-33 |
| 44 | 32-31 |
| 45 | 30 |

S. S. WYPO FILE MADE IN U.S.A.

WYPO TIP CLEANERS PAT. NOS. 2429581, 2473758 IN CANADA 1948

MASTER SET OF (31) Cleans (46) Drill Sizes Nos. 75 to 30 Incl.

Replacement cleaners and files available. Cleaning Range— Cleaner No. & Drill Nos. stamped on back of each case. WYPO GIVES YOU MORE!

SOLD BY LEADING WELDING SUPPLY DEALERS

WYPO

**MAITLEN AND BENSON, INC.**
1395 Obispo St., Long Beach 4, Calif.

**Circle No. 49 on Reader Service Card.**

# IT'S A FACT

YOU CAN DO BETTER WITH

DE-STA-CO

TOGGLE CLAMPS

**LIKE THE NEW MODEL 630**

Designed for jobs requiring fast holding action, the new 630 is a medium duty, plunger type that locks in either push or pull position—has holding pressure of 1600 pounds. Flared end, heavy Vinyl-covered safety handle. Solid one piece forged base—large diameter bearings—heavy steel linkage—plunger copper plated with Irrelac finish.

**OVER 140 OTHER MODELS**

Choose from 13 standard styles, over 140 models—holding power from 50 to 12,000 pounds—Templates available on request.

**FOR MORE FACTS**
REQUEST
INFORMATIVE CATALOG
**YOU CAN DEPEND ON DE-STA-CO**

DETROIT STAMPING COMPANY
350 MIDLAND AVENUE
DETROIT 3, MICHIGAN
DE-STA-CO

Circle No. 21 on Reader Service Card.


in literature from Fenway Machine Co. Illustrated brochure describes complete line of nibblers that will cut up to ¼ inch steel, 8 gage stainless, and 5/16 inch aluminum.

**Circle No. 29 on Reader Service Card.**

**CRANE ASSEMBLIES,** hoists and accessories are featured in a brochure available from the Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc. Illustrated folder No. 18000-16-60 gives suggestions for solving load handling problems.

**Circle No. 336 on Reader Service Card.**

**AUTOMATIC ARC** machines are the subject of an 8-page bulletin from Taylor Winfield Corporation. Bulletin 8-513A describes 14 high production machines that feature mechanical loading, inspection and automatic unloading.

**Circle No. 337 on Reader Service Card.**

**WROUGHT IRON** welding reducers are the subject of a price list issued by Steel Forgings, Inc. Prices are given for concentric and eccentric reducers in sizes ranging from 1- through 24-inches in standard and extra strong grades.

**Circle No. 338 on Reader Service Card.**

**MAGNETIC HANDLES** are described in literature available from Smith's Magnet Sales Co. Diagrams show how handles can be used to lift loads up to 300 lbs. Specifications are given.

**Circle No. 339 on Reader Service Card.**

**POSITIONER RENTAL** is described in a folder from Ransome Company. The folder points out advantages of renting positioners, turning rolls, manipulators, and head-and-tailstocks for weeks, months, or even years.

**Circle No. 63 on Reader Service Card.**

**TYPICAL WELDMENTS** and how they are fabricated are featured in a 24-page catalog from CPC Engineering. The catalog lists the company's welding and fabricating equipment and their capacities and specifications.

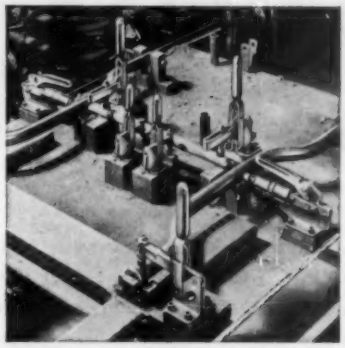
**Circle No. 340 on Reader Service Card.**


# IT'S A FACT

YOU CAN DO BETTER WITH

DE-STA-CO

TOGGLE CLAMP SECURITY



BECAUSE when you have the work held by De-Sta-Co clamps you know it will stay put until the job is done.

BECAUSE there's a De-Sta-Co clamp immediately available with just the holding power you need for any job—large or small.

BECAUSE you can choose from over 140 models that will push, pull or lock with forces from 50 to 10,000 pounds.

**FOR MORE FACTS**
WRITE FOR INFORMATIVE
TOGGLE CLAMP CATALOG
**YOU CAN DEPEND ON DE-STA-CO**

DETROIT STAMPING COMPANY
350 MIDLAND AVENUE
DETROIT 3, MICHIGAN
DE-STA-CO

Circle No. 22 on Reader Service Card.

*for the best braze in the business... it's the*

# NEW AIRCOSIL FLUXCOR

Airco's new silver alloy wire, AIRCOSIL FLUXCOR, is a real time and money saver. It reduces or eliminates the time normally needed for separate fluxing of parts. It minimizes flux inclusions. It gives exactly the right amount of flux every time for a good strong joint—no more weak joints because of poor fluxing—no more wasted fluxing.

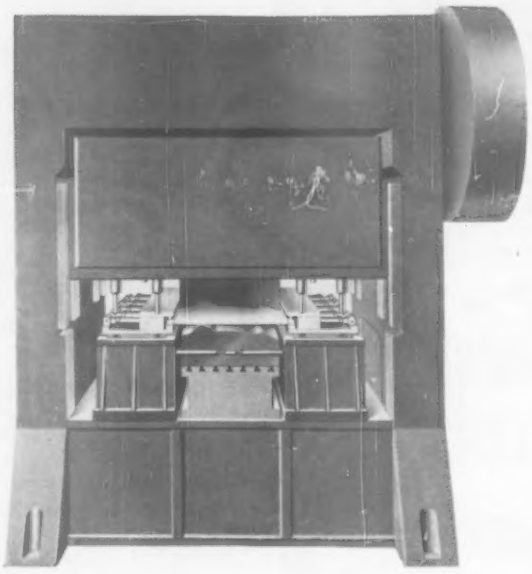
In addition, Aircosil Fluxcor minimizes the danger of voids resulting from improper pre-cleaning. It can be used readily by operators who have very little brazing experience. Aircosil Fluxcor has an alloy content which is equivalent to a 3/64" diameter solid brazing wire.

For immediate delivery and complete information phone your nearby Airco office or local distributor.

AIRCO® **AIR REDUCTION SALES COMPANY**

150 East 42nd Street, New York 17, N. Y.
On the West Coast—Air Reduction Pacific Company
*Division of Air Reduction Company Inc.*
Authorized Airco Distributors in most principal cities
**Circle No. 3 on Reader Service Card.**

# NEW PRODUCTS



## Stretch Forming With Standard Draw Presses

A draw press attachment that eliminates the need of a draw ring has been developed by Cyril Bath Company. Big advantage of the attachment is that blank size and thickness can be reduced, die costs, upkeep, and set-up time lowered.

How it works: The attachment stretches the metal before die forming. Press movement brings the stretched metal down over the die, and immediately, the upper die comes down on the lower to finish the work. Stretch forming, by means of the hydraulic heads, eliminates trapped metal and wrinkles. When the part is formed, the stretch tension on it is relieved and the upper die withdrawn.

By eliminating the draw ring, shallow draw panels like automotive roof tops, door panels, rear decks, and hoods can be produced cheaper. In die costs, upkeep, and set-up time, savings have been as high as 66 percent. Savings of 20 percent in metal are made possible by using lighter and less expensive sheet and smaller blanks.

The process produces a far stronger and harder part due to the prior stretching of the metal. This practically eliminates oil canning and in effect the entire sheet is formed rather than just in areas of impact. The amount of stretch may be varied to suit the shape or the hardness of the metal. The process can be used on aluminum, stainless steel, titanium, and other thermal-resistant alloys which cannot be worked in conventional die operations. In many cases, heating before forming is eliminated.

**Circle No. 200 on Reader Service Card.**

## Portable Dark Room

A new portable dark room trailer has been developed by Jem Penetrameter Mfg. Corp. for on-the-spot development of radiographic films.

The lightweight trailer is 11 feet long and 6 feet wide and has an 8- by 4-foot working area. It has a standard box-type metal frame covered with color-impregnated fiberglas. It comes with a ball joint coupler and jackstand.

**Circle No. 201 on Reader Service Card.**

**FACTS AT YOUR FINGERTIPS:** *If you want copies of the catalogs featured on these pages, just circle the appropriate numbers on the bound-in Reader Service Card. We'll do the rest.*

## All-Aluminum Tip Holder

A new, lightweight, corrosion-resistant offset spotwelding tip holder is available from Air Reduction Sales Co. Most of the wear on the holder is absorbed by an easily-replaced tip adapter. Holders come in standard 2- and 4-inch offsets.

**Circle No. 202 on Reader Service Card.**

## Three-Phase Rectifier

The Lincoln Electric Co. announces a complete line of new three phase rectifier d.c. arc welders for general production use. The Idealarc R3M series is available in four sizes: 300, 400, 500, and 650 amps. They are designed to NEMA industrial standards of 40 volts, 60 percent duty cycle.

**Circle No. 46 on Reader Service Card.**

## French Bevel Shear

The Metal Processing Machine Co. has been licensed to manufacture, sell and service a new shear designed by Corpet Louvet et Cie., Paris. The shear squares and bevels plate steel and other metal from ¼ inch and up. Its 10-foot blade will edge-shear plates of any length.

**Circle No. 228 on Reader Service Card.**

## Portable Welding Platform

The Globe Hoist Co. has developed a 4-post, electric portable welding platform. The lifting capacity is 2000 lbs. When fully raised it is 79 inches off the floor. The base area is 3 feet, 6 inches by 13 feet.

**Circle No. 204 on Reader Service Card.**

**For More Information Circle No. 20 on Reader Service Card.**

*30% MORE THAN THE AVERAGE ACETYLENE CYLINDER

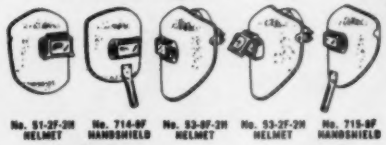
COYNE cylinder company

224 Ryan Way, South San Francisco, Calif. • PLaza 6-6910
155 West Bodley Ave., Memphis, Tenn. • WHitehall 8-7789
3800 Springdale Ave., Glenview, Ill. • PArk 4-3828
24 Commerce Street, Newark, N. J. • Mitchell 2-1618

WELDING JOBS that must be done fast and well,

now more than ever, need helmets that offer the best in safety and comfort. Of necessity they must be lighter in weight, stronger and stoutly reinforced, non-warping, have higher resistance to heat, adjust easier, fit better and be simpler to clean and sterilize. All these qualities come in good measure when you select Flood's improved Fiber Glass Helmets with new FIT-RITE headgear.

No. 51-8F-2H HELMET



No. 51-2F-2H HELMET | No. 714-8F HANDSHIELD | No. 53-8F-2H HELMET | No. 53-2F-2H HELMET | No. 715-8F HANDSHIELD

INSTANT Head Size Adjustment

Flood Always FINEST QUALITY FAIRLY PRICED

For further information see your distributor or contact:

FLOOD SAFETY PRODUCTS CO.
3037 WEST LAKE STREET, CHICAGO 12, ILLINOIS

**For More Information Circle No. 31 on Reader Service Card.**

Job Report Courtesy of Electric Boat Division, General Dynamics Corp., Groton, Conn.

**For maximum weld strength at sub-zero temperatures**

**WELD WITH ARCOS**

**LOW ALLOY ELECTRODES**

The Skate (above), as well as the Nautilus, Seawolf, Swordfish, Skipjack and Triton are among the "greats" in America's atomic powered sub force carrying welds produced by ARCOS low alloy electrodes. ARCOS Tensilend 80, 100, 120 and Ductilend were used to assure welds of highest possible impact strength whether on missions in the tropics or the sub-zero arctic. When you need weld metals with similar qualities, ARCOS is well worth remembering. ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Pa.

**For More Information Circle No. 11 on Reader Service Card.**

## Magnetic Particle Testing

Picker X-Ray Corporation has added two portable units to its line of magnetic particle inspection equipment. Units are contained in a compact case, light enough for one man to carry.

One, called Ferroflux, magnetizes in any direction through positioning, works on painted or unpainted parts. The unit offers an optional voltage regulator and operates on 110 volts a.c. It also has built-in silicon rectifiers for d.c. supply.

The second unit, called Portaflux (shown), provides longitudinal and circular magnetizing with coil and prod techniques. It requires only 10 amps from a 110-volt a.c. line and has three-position intensity control.

**Circle No. 205 on Reader Service Card.**

## Welder-Power Plant

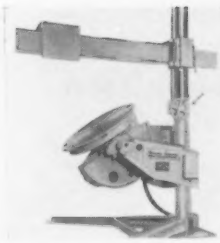
The Hobart Brothers Company has announced the GW-2235-S combination d.c. welder and a.c. power plant. Unit provides 200 amps d.c. at 25 volts on 100 percent duty cycle for straight- or reverse-polarity welding. Power output is 2 kw at 110 volts a.c. when welding, or 5 kw at 110/220 volts a.c. when used as a generator.

**Circle No. 206 on Reader Service Card.**

## Hardsurfacing Rods

Cast and centerless-ground hardsurfacing rods, made to customer specifications, are available from WaiMet Alloys Co. Rods are supplied bare, for oxyacetylene welding, or coated for a.c. or d.c. welding.

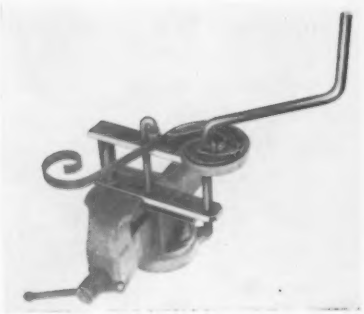
**Circle No. 207 on Reader Service Card.**



### Positioner-Manipulator

Ransome Company has announced a new automatic welding station. It consists of a 4' by 4' manipulator combined with a Model 25P positioner to do two welding positioning operations. Capacity is 2,500 lbs.

**Circle No. 208 on Reader Service Card.**



### Scroll Bender

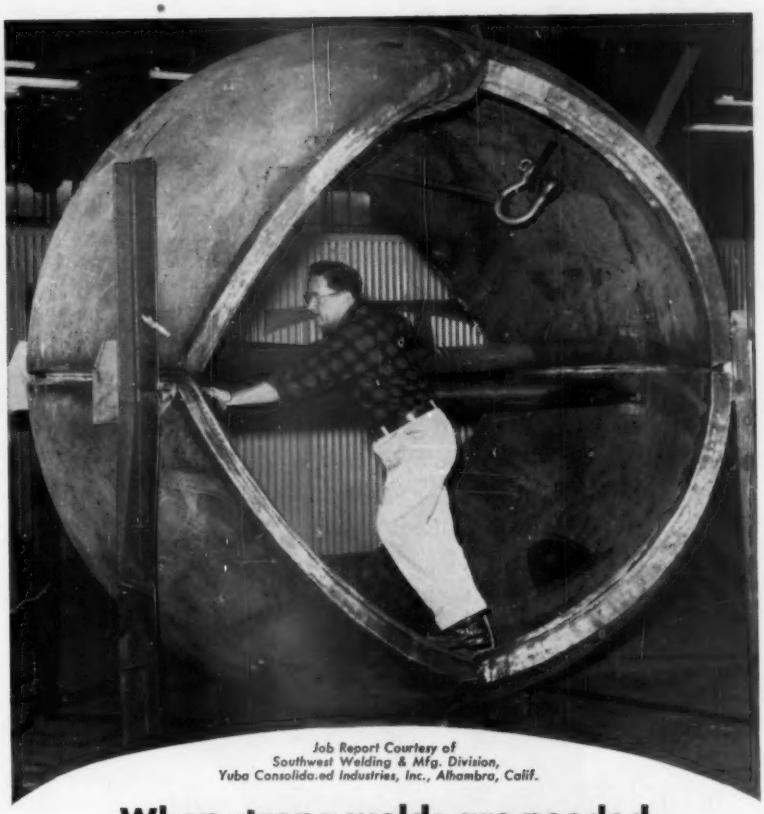
A new hand-operated bender has been introduced by Hossfeld Mfg. Co. The bender which is held in a bench vise, includes three dies for forming 2½, 4, 5, 6½ and 8 inch diameter scrolls.

**Circle No. 209 on Reader Service Card.**

### Nibbler Attachment

The Hedstrom Tool Company has developed a nibbler attachment to be used with any standard hand drill. It is a punch and die unit that cuts flat or corrugated sheets up to 18 gage carbon steel, and 22 gage stainless. The unit, called Nibblex, cuts straight lines, circles or angles. Its average cutting speed is 7fpm. It weighs only 11 ounces.

**Circle No. 210 on Reader Service Card.**

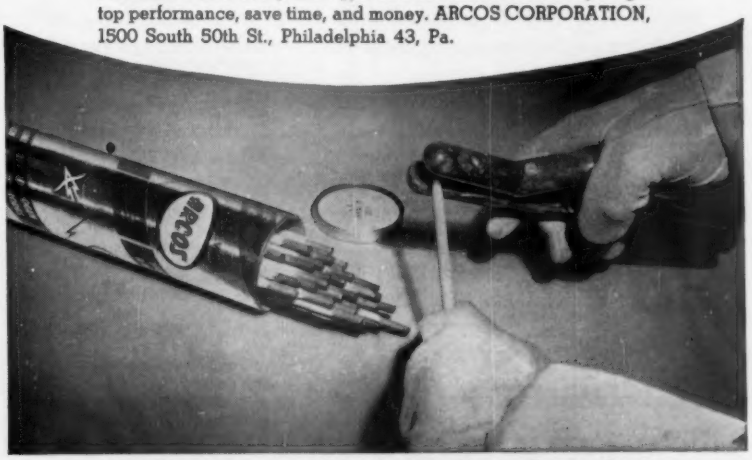
*Job Report Courtesy of*
*Southwest Welding & Mfg. Division,*
*Yuba Consolidated Industries, Inc., Alhambra, Calif.*

**When strong welds are needed to resist impact at minus 320°F**

**WELD WITH ARCOS**

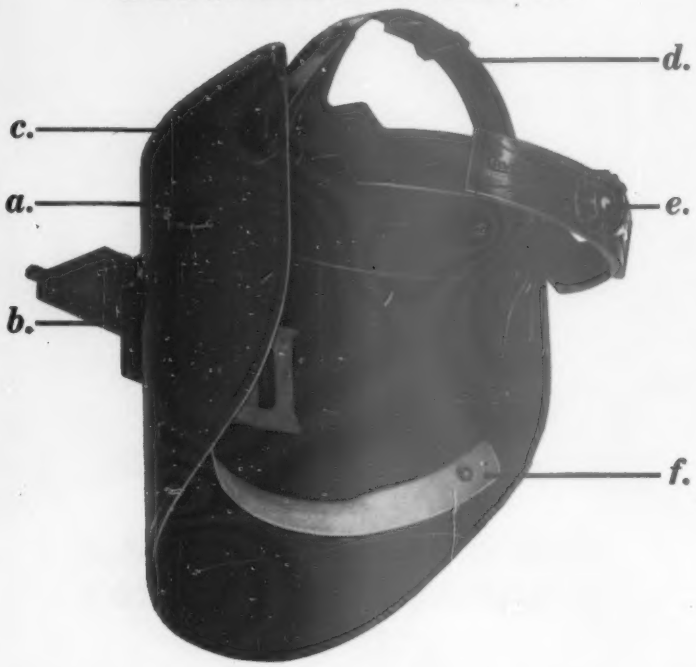
**STAINLESS ELECTRODES**

This six-section spherical liquid oxygen container is made of Type 321 stainless steel. Walls 4½" thick were required to withstand 3000 psi pressure. To assure crack-free welds to meet ASME impact properties at −320°F, it was welded with Arcos Chromend 19/9Cb-LC electrodes with controlled ferrite. The first time—and every time you use Arcos electrodes—you get top performance, save time, and money. ARCOS CORPORATION, 1500 South 50th St., Philadelphia 43, Pa.




**For More Information Circle No. 12 on Reader Service Card.**

# Next time you pick up your helmet...see if it gives you all the advantages of this OXWELD helmet




**a.** *One-piece seamless shell* molded from tough glass-fiber-reinforced polyester resin—lightweight, easily cleaned, strong, non-warping.

**b.** *Flip-front glassholder* die-cast from aluminum, stationary glassholder molded as integral part of shell for a light-tight seal.

**c.** *Fingertip tension adjustment* to hold helmet in up or down position. "CP" joints of durable plastic will not pass electric current.

**d.** *Adustable crown strap* holds helmet firmly in choice of five positions.

**e.** *Rear knob* instantly adjusts headband size over wide range without need for removing helmet.

**f.** *Adustable fiber chin rest* assures proper visual alignment and maximum comfort.

Compare these advantages with those offered by any other helmet. There are eight different types of OXWELD helmets and handshields. And each is designed with every advanced feature for maximum protection against infra-red and ultra-violet rays, sparks, and molten metal.

Comfort is a big factor. OXWELD helmets have been given the careful detailing that provides easy, instant adjustment, snug fit, and the "free-floating" suspension that eliminates pressure points. You can choose from three sturdy shell styles.

See them at your LINDE distributor's. Or write for literature and price lists. Linde Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N.Y. *In Canada*, Union Carbide Canada Limited, Linde Gases Division, Toronto 12.

**LINDE COMPANY**

UNION CARBIDE

"Linde", "Oxweld", and "Union Carbide" are registered trade marks of Union Carbide Corporation.

**For More Information Circle No. 47 on Reader Service Card.**




## Temperature Indicating

Temperature indicating crayons and paints are now being marketed by Air Reduction Sales Company. These materials can be used in any application where correct determination of temperature is important. Temperature indications of any hot surface are made by distinct changes in color.

Eighteen Thermocron crayons provide temperature measurements from 150°F. to 1240°F. Thirty-six Detecto-Temp paints (13 with multiple changes) cover a measurement range from 104°F to 246°F.

**Circle No. 211 on Reader Service Card.**

## Weld Shop on Wheels

Transportation for the welder and his tools is easily solved by Cushman Motors. The small Cushman Truckster is powered by a 4-cycle, 7.95-hp engine, has a 3-speed transmission, and has heavy duty hydraulic brakes on all three wheels. The unit is designed to carry 800-lbs. and can be equipped with both electric and acetylene welding equipment.

**Circle No. 212 on Reader Service Card.**

## Winter Hat Liners

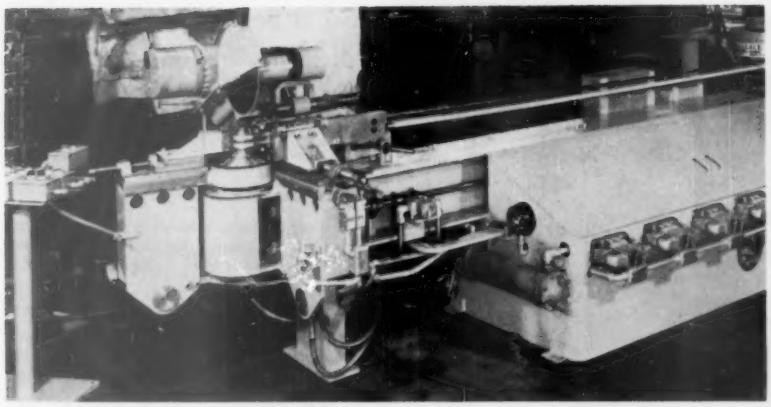
Six new safety hat winter liners are available from Jackson Products. The metal-free liners fit all hats. Model FC-2 (shown) features a ⅝-inch-deep all-orlon pile lining. All styles are washable.

**Circle No. 213 on Reader Service Card.**

## Metering Regulators

The Harris Calorific Co. has announced a new line of metering regulators for oxygen, carbon dioxide, helium, nitrogen, argon, hydrogen, propane and acetylene. These regulators are extremely accurate and show flow in cubic feet per hour.

**Circle No. 214 on Reader Service Card.**



### Pipe Bender-Cutter

In just four seconds this Wallace Supplies Mfg. Company machine bends and cuts pipe and tubing, one- or two-at-a-time. It will bend and cut a number of tube and pipe sizes by means of interchangeable dies. Shown here, the machine is making two 90° bends in 1⅛-inch O.D. copper tubing to a center-line radius of 1⅛ inches. After bending, a friction saw cuts the tubes and the bends are automatically ejected.

**Circle No. 215 on Reader Service Card.**

### Crane End Truck

A new type overhead crane end truck which has been designed to give full articulation during travel has been introduced by the Spanmaster Div. of Jervis B. Webb Company. The design provides the needed flexibility formerly obtained by the use of floating runway suspensions. With the new end truck, runways can be rigidly supported to provide a more stable system at lower costs.

**Circle No. 216 on Reader Service Card.**

"What's the secret of your strength, HERCULES?"
"No secret—I use only virgin alloys in my spotwelding tips and machine them with the best equipment money can buy."

Resistance Welding Alloys our only product. An abundant inventory of spotwelding tips and related accessories, as well as the various grades of copper-alloy bar stock, maintained at all times.

tips—holders—wheels—copper alloy bar stock, forgings and castings

Catalog Available On Request

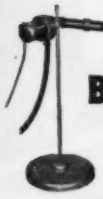
**HERCULES** WELDING PRODUCTS CO.
11478 Timken Ave., Warren, Michigan
JEfferson 9-2610

**Circle No. 39 on Reader Service Card.**

**QUIK-HEAT**

up to 2200° F.

CLEMENTS
**Cadillac**
MODELS K3 & M2
**BLOWTORCHES**



Here are rugged, high efficiency blowtorches that speed up all types of heat treating and production operations. These two Clements Cadillac Blowtorches provide heat up to 2200°F. in seconds and are fully portable.

With the Clements **Cadillac** model K3 or M2 you can bring the torch to the work instead of the work to the torch as in fixed installations. Furnished fully equipped with 20 ft. of Underwriters' Laboratories and Canadian Standards Association approved 3-wire cable with plug, 10 ft. of gas hose with fittings ready to attach to your gas line and with sturdy, high stability stand. Easily adjustable for height and direction of torch.

*Operates on natural, manufactured, or LP-gas.*

**CLEMENTS MFG. CO.**
6646 S. Narragansett Ave., Chicago 38, Ill.
*SINCE 1910*
INDUSTRIAL PRODUCTS DIVISION

**Circle No. 83 on Reader Service Card.**

# SPECIALIST-

## your LINDE distributor

It takes more than a line of welding equipment to be a LINDE distributor. It takes real knowledge of your welding needs . . . knowledge of local industry . . . practical experience and interest in efficient welding operations . . .

These are some of the qualifications that make your LINDE distributor so valuable to your business. He's a specialist in his field, equipped with a complete stock of welding and cutting equipment, industrial gases, welding rods, supplies, and accessories. They're all products of highest quality and proved efficiency. Your LINDE distributor is ready to help you today, with equipment, expert advice, and the benefits of LINDE's 50-odd years of welding and cutting leadership.

A telephone call will prove the point. Look up your LINDE distributor in the classified directory. Or write to Linde Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. *In Canada,* Union Carbide Canada Limited, Linde Gases Division, Toronto 12.

**LINDE COMPANY** UNION CARBIDE

"Linde" and "Union Carbide" are registered trade marks of Union Carbide Corporation.

**Circle No. 48 on Reader Service Card.**

Circle No. 73 on Reader Service Card.

**Speed-Up WELDING**

**WITH THESE LABOR-SAVING DEVICES!**

**Bench Model POSITIONER TURNTABLE**

Holds work in any position—vertical to horizontal. Will carry 100 lb. load. Smooth stepless speed change, both forward and reverse, from zero to 6 rpm (greater speed if desired). Weight 20 lbs.

Ideal for aircraft work. Reduces rejects, increases output up to 20%. Gear driven motor, V-belt transmission, tension control, built-in ground for uniform welds.

**Need a 3rd Hand?**

**for Holding Small Work Pieces—then you need our "HANDY HAND"**

that holds up to 3-lb. work pieces at any angle—rigid—yet easily, quickly moved to any other desired position. Clamps to any 2" bench or table top. Its flexible and rotating head gives complete flexibility in any and all positions desired.

**DEALERS—Write for details**

*For additional information, prices, etc., write*

**SUPERIOR WELDING CO.**

3410 E. 14th St., Los Angeles 23, Calif.

## AC/DC Silicon Rectifier

The A. O. Smith Corporation is now manufacturing an a.c./d.c. silicon rectifier welding machine with a 100 percent duty cycle. The welder, rated at 500-amps, is designed to replace 600-amp motor-generator sets on semi-automatic submerged arc welding applications.

**Circle No. 219 on Reader Service Card.**

## Cryogenic Pump

The Cosmodyne Corporation has announced manufacture of a high-pressure, high-flow cryogenic pump. The unit is a 5-cylinder, fixed-displacement pump, that delivers up to 20 gpm at pressures up to 15,000 psi. Seals prevent lubricants from contacting the cryogenic fluid. Pistons and valves operate without lubricants.

**Circle No. 220 on Reader Service Card.**

## Wide-Vision Helmet

Flood Safety Products Co. is manufacturing a new wide-vision welding helmet with over 19 square inches of lens opening. Fiberglass or vulcanized fiber helmets furnished with snap-in Fit-Rite headgear or safety cap.

**Circle No. 221 on Reader Service Card.**

## Resistance Welding Regulator

A redesigned plug-in current regulator for resistance welding control is available from General Electric. It is claimed that the regulator assures better weld quality by compensating for all three factors that might change the welding current.

An instrument-type current transformer senses current in the primary of the welding transformer. The current pulse is automatically controlled.

**Circle No. 222 on Reader Service Card.**

**cut weld cleaning time by 85%**

**THROW AWAY YOUR COLD CHISEL AND WHISK OFF WELD SPATTER WITH A DRY RAG!** Protect-O-Metal spatter-proofing compounds make weld cleaning a breeze. Improve your welds at the same time . . . P-O-M compounds quiet the arc, improve oxidation and annealing scale, cause no porosity. No smoke, odors, or fumes.

**P-O-M No. 2.** Non-inflammable, non-toxic, water-soluble paste. Inorganic. Thin before applying and start welding at once. $3.40 per gallon, f.o.b. Dayton.

**P-O-M No. 8.** Rust- and corrosion-resistant resin base compound. Comes ready to use. Safe for all metals. Good paint primer; permits outdoor storage of sub-assemblies. $3.45 per gallon, f.o.b. Dayton.

**Money-Back Trial Offer.** Order a trial gallon of each today for testing in your shop. We'll cancel the bill if you're not satisfied.

**Prevents Heat Treat Scale . . .** up to 1500°F. Brush on, heat, brush off. All metals.

**PROTECT-O-METAL**

**G. W. SMITH & SONS, INC. • 1701 Spaulding Rd., Dayton 3, Ohio**

**For More Information Circle No. 70 on Reader Service Card.**

**CUT BEVELING TIME BY 85% on Small Weldments**

**PULLMAX BEVELLER**

The PULLMAX Beveller can be used to bevel cut large size plates with proper table support and feeding arrangement. But where the PULLMAX Beveller really pays off is in small segments difficult to bevel cut by burning and grinding.

Bevel small plate in both straight and mild radius shapes at speeds up to 11 ft. per min.

| | | | A | B |
|---|---|---|---|---|
| A | 1 Cut | Mild Steel | ½" | 1" |
| B | 2 Cuts | Stainless Steel | ⅜" | ¾" |

*Write today for literature and information*

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Pullmax (Canada) Limited, P.O. Box 460
S. Service Rd., Oakville, Ontario

**PLANT MAINTENANCE SHOW CHICAGO BOOTH 642 JAN. 23-26**

**For More Information Circle No. 7 on Reader Service Card.**

### Water-Cooled Jacket

The S-M-S Corporation has developed a water-cooled jacket for use with their Quick Change electrode. The device provides water cooling in projection welding nuts and studs.

**Circle No. 223 on Reader Service Card.**

### E6013 Electrode

Hobart Brothers Co. has developed a new E6013 electrode which contains a small amount of iron powder in the coating to improve arc stability on out-of-position welding. The Hobart 447A can be used on a.c. or d.c.

**Circle No. 224 on Reader Service Card.**

### Aluminum Electrode

The All-State Welding Alloys Company, Inc. has announced an all-purpose, Smoothcote #34 aluminum electrode with a patented extruded flux coating. The electrode develops a tensile strength of up to 28,000 psi. Core wire is aluminum alloy 4043.

**Circle No. 230 on Reader Service Card.**

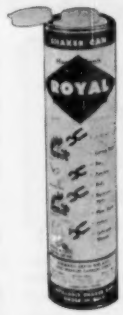
### Inert Arc Welders

Metal & Thermit Corporation has announced two new inert arc welders. One is an a.c./d.c. machine; the other is a.c. only. The Muretran models can be used for manual, semi-automatic, automatic, inert-gas spot, or Sigma welding. Both models are equipped with a built-in high-frequency stabilizer, primary line contactor, separate control transformer, thermal overload protection and remote control cable.

**Circle No. 225 on Reader Service Card.**


**Circle No. 10 on Reader Service Card.**

## IT'S NEW: SO HANDY

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**NEW "ROYAL" HARDENING POWDER**

**In the Shaker Can**

"ROYAL" HARDENING POWDER is safe to use. No Toxic fumes. Hardens low-carbon steels equally as well as cyanides.

- So easy to use now. Just sprinkle "ROYAL" on heated edge of Tool, Plow Share or other articles to be hardened. Let "ROYAL" liquidize in heat.
- Remove, clean and quench in regular manner.
- Enables the weldor or blacksmith to produce a finer cutting tool with longer life, without expensive equipment.
- Produces a .01 to .02 in. case depth with necessary Brinnell toughness on large or small low-carbon steel tools or parts.

**Send for free sample and literature**

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# DURO ELECTRODE HOLDERS

## THE DURO "STANDARD"

- Featuring "Long Jaw Design" for reaching hard to get at places.
- Cool operation—cool handling.
- Insulated handle and guard protects the operator.
- All parts easily replaced.

## THE "ADJUSTABLE TENSION"

- Easy adjusting of Spring Tension for your requirements.
- New type cable connection prevents fraying of cable.
- Aluminum model weighs only 13 oz.
- All parts replaceable including copper alloy jaw.

For further information write:

## THE DURO ENGINEERING COMPANY

31 Oregon Avenue, Hamden 17, Connecticut

**For More Information Circle No. 24 on Reader Service Card.**

Circle No. 68 on Reader Service Card.

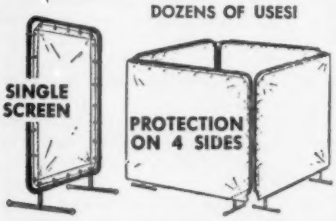
THOUSANDS NOW IN USE

ALL SIZES

3-SIDED MODEL

*SINGER SCREENS* have met with the approval of many industries. Incredibly light in weight. Rust-proof steel. No threads —assembles in minutes. Curtains of duck, neoprene-coated fiber glass or Johns-Manville aluminized asbestos cloth.

DOZENS OF USES!




NEW BIG CATALOG

Describes screens in detail. Complete line of work gloves, welding gloves and safety clothing.

Ask your dealer or write: *Special Products Division*

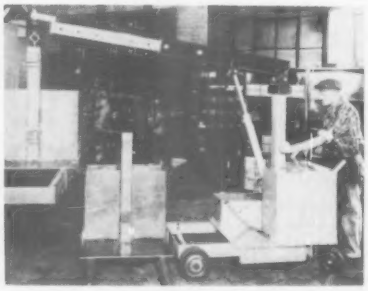
SINGER GLOVE MFG. CO.

860 W. WEED St., CHICAGO 22, ILL.

## Flame Hardener

A machine has been developed by Victor Equipment Co. to flame harden rebuilt tractor rollers. The machine has dual torches that harden the inside and outside of the rollers simultaneously, thus preventing distortion. Hardness is about 50 Rockwell C.

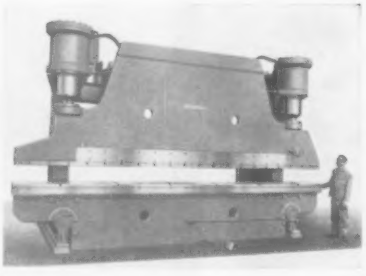
**Circle No. 226 on Reader Service Card.**



## Mobile Crane

The Aero-crane, a counterbalanced mobile floor crane, is manufactured by the Vanguard Mfg. Co. This battery-powered crane can be hand pushed or self-propelled. Models of different capacities are available.

**Circle No. 227 on Reader Service Card.**



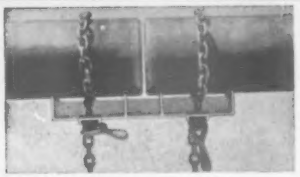
## Hydraulic Press Brake

A hydraulic press brake with a bed that extends 36 inches below the floor level has been developed by the Steelweld Machinery Div., of Cleveland Crane & Engineering Co. The over-all press length is 20 feet, 3 inches. The press is available in capacities to 2,000 tons for bending mild steel from 10 gage to 2 inch, and in lengths to 30 feet.

**Circle No. 203 on Reader Service Card.**

Circle No. 43 on Reader Service Card.

SEE JEWEL FOR . . .



The JEWEL Pipe Clamp

. . . aligns and holds pipe for tacking. Two sizes: ½" to 8" and 8" to 16". Sturdy construction for hard usage.

*The JEWEL Elbow Clamp* lines up welding elbows from 2½" to 8" at right angles to the pipe and holds them until tacked.

*The JEWEL Angle Clamp* holds branch line at right angles to the main or headers. Takes any size main or branch from ½" to 12".

*The JEWEL Flange Clamp* lines up the flange face at right angles to pipe end and holds until tacked. Takes size from 2½" to 16".

*The JEWEL Pipe Marker* marks a perfect hole and saddle on any pipe up to 20".

*Write For Details*

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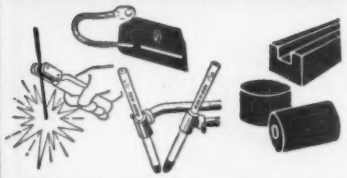
HAS IT...OR CAN MAKE IT—

if it's CARBON or GRAPHITE!



*Graphite Cores and Chills—Graphite Powder and Particles of any mesh . . . complete Graphite Fabrication Facilities.*

BRUSHES . . . for all motor and generator applications . . . carbon, graphite, copper leaf, gauze and metal-graphite.

WELDING ELECTRODES, WELDER BRUSHES . . . Keen-Cut Electrodes for carbon arc-air jet cutting . . . Keen-Arc Carbons, cored and heavily copper coated, for twin-arc torches . . . paste, rods and plates.

EXTRUSIONS, MOLDED SHAPES OR SPECIAL CARBONS designed and produced to your specifications.

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THE ONLY IRON WORKER OF ITS KIND ON THE MARKET TODAY

*No Grinding Necessary After Cut. One Stroke Cycle Clutch Operated by Hand or Foot.*

The Bateman "Bantam" cuts 2" x 2" x ¼" angles and ¼" x 4" flats. Standard punches will fit this machine. The Coper will cope 1¼" through ⅛" material. It will punch ½" hole through ¼" material. With the clutch open, the Bantam will make 44 strokes per minute. It is made of high-grade cast iron, with the clutch, pin and dog made of hardened steel. The blades are made with tool steel. It is powered with a fly wheel and gear drive, and uses a small ¾ hp motor, 1750 rpm.

**Bateman Bantam with punch....$575.00**
**Shear only .....$495.00**
*Shipping wt. 750 lbs.*

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MINERAL WELLS, TEXAS

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WORLD'S FINEST EXHAUST SYSTEMS FOR THE MOST EFFICIENT SHOPS

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Discover why Engwald exhausts are preferred by hundreds of welding shops, garages, factories, plants where ventilation has been a problem. Efficient units clear away dangerous fumes at their source—before they can harm workers—save untold loss of manhours and money. All types from portable units, stationary units, to systems for multiple installations.

FREE ENGINEERING SERVICES—Our highly qualified engineers will assist you in designing an exhaust system most suitable for your needs.

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**EISLER** makes the largest assortment of **ELECTRIC SPOT, WIRE BUTT, SEAM, TWEEZER, GUN** and **FLASH WELDERS.** We also carry in stock a variety of **WELDING TIPS** and **ACCESSORIES.**

EISLER ENGINEERING CO., INC.
735 So. 13th St., Newark 3, N.J.

Circle No. 25 on Reader Service Card.

## 3-Phase Input AC-DC Welder

An AC-DC arc welder with 3-phase input has been introduced by Vickers Incorporated, Electric Products Division.

Circuits utilize three-phase power to provide both the a.c. and d.c. outputs, with a range of 6 to 400 amperes d.c., 6 to 250 amperes a.c. in the Controlarc Model 330. Full single range operation on a.c. and d.c. permits the use of standard Vickers slope controller without limitation due to range switches. The machine also includes special low-range AC for high performance low current TIG and stick electrode welding, with a low current resistor available for test lab and experimental welding.

Dual continuous control is maintained on both AC and DC, with adjustable controlled arc characteristics (curve slope and response speed).

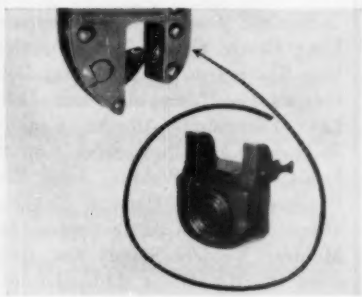
**Circle No. 77 on Reader Service Card.**

## Additions to Buyers Guide

"The Buyers Guide To Mechanical Cutting Equipment" which appeared on page 59 of our October issue was incomplete. These companies were inadvertently omitted:

*Beaver Pipe Tools, Inc.*, Abrasive Machine Div., Warren, Ohio: manufacturers of abrasive cutting machines and discs.

*Homestrand Machine Tool Corp.*, Greenwich, Conn.: manufacturers of standard and radial drill presses; metal workers and iron workers, and nibblers.



## Lifting Clamp Adapter

A pad adapter has been announced by Merrill Brothers for use with their Special Opening G Clamp. The adapter makes one clamp do a lot of lifting jobs by being able to handle a wide range of material thicknesses.

**Circle No. 229 on Reader Service Card.**

Circle No. 19 on Reader Service Card.

# Chemclean 536

- **Prepares aluminum and stainless for welding.**
- **Removes scale and oxides before or after welding.**

Eliminate costly, time-consuming grinding, scratch-brushing, or sanding on stainless steel. Simply wipe oxide off with one or two strokes of hand applicator. Clean small parts by dipping.

*For Aluminum, just wipe or dip at room temperature*

*

# New! Coppa-Dip

*Imparts a bright lustrous golden finish on Copper, Brass and Bronze. Retards oxidation.*

Send for free technical bulletin.

# CHEMCLEAN

**PRODUCTS CORPORATION**
**15-08 121 St., College Point 56, N. Y.**
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INDUSTRIAL CHEMICALS AND SPECIALTIES

specializing in chemicals for cleaning, chemical polishing, metal finishing.

# DO YOU HAVE UNSOLVED TESTING PROBLEMS ?????

They can be solved. We design and build special testing machines to fit the most peculiar requirements.

Tell us about yours.

DETROIT TESTING MACHINE COMPANY
9396 Grinnell Avenue, Detroit 13, Michigan

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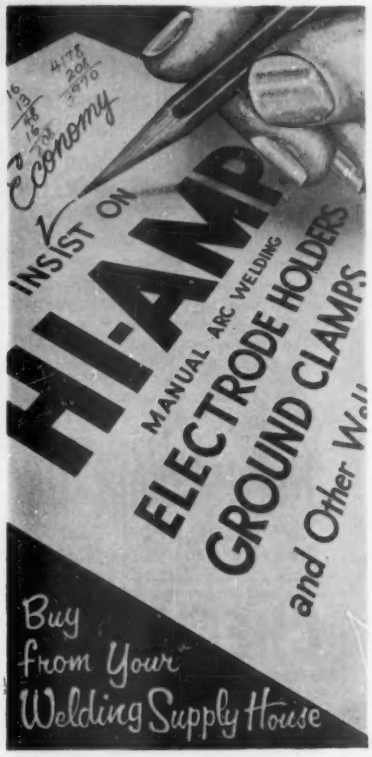
Circle No. 44 on Reader Service Card.

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**IN 1936, MORT CLARK, then Vice-President of the world's largest sign manufacturer, wanted a welded galvanized sign frame. Every welder manufacturer said it couldn't be done . . . Mort Clark did it, received a check and certificate of achievement from the Lincoln Welding Foundation—and**

MORT CLARK'S **GALV-WELD** ALLOY ORIGINAL & GENUINE

**WAS BORN**

**The Navy didn't believe, tested it 3384 hours in salt spray (100 hours is normal), then approved it. Westinghouse reports Galv-Weld roof sign, installed 1936—still perfect in 1959—23 YEARS LATER!**

**TIME PROVEN — MODESTLY PRICED WHY EXPERIMENT?**

**Regalvanizes corrosive seams and areas where galvanizing is burned away by welding, skipped in hot dip galvanizing, or abraded in fabrication.**

**Eliminates corrosion areas produced by welding, so that weld will stand up under paint, WITHOUT rust, as on ornamental iron. Simply use residual heat from welding, or reheat, wire brush, and apply. No fluxing—No fumes.**

**Makes every welder a galvanizer of small weldments or parts. Repairs chipped porcelain, rusted appliances, rusted auto, truck or trailer bodies, frames, fenders, or other steel products. Can be readily refinished to match surrounding surface.**

**Ideal for pipe joints, galvanized structures, water and fuel tanks, duct systems, cold storage lockers, sinks, drains, washers, towers, steel buildings, railings, etc.**

***Some distributor franchises still available.* Cash in on *consistent campaign now running in 10 national magazines.***

Mail Coupon Today

**GALV-WELD PRODUCTS**

Dept. WDF — Box 1303 — Bradenton, Fla.

Send Information User ☐ Distributor ☐ Dealer ☐ Free Sample ☐

Name .....

Address .....

City ..... State .....

Circle No. 33 on Reader Service Card.

**NEW ADDITION** to headquarters plant as . . .

## Eutectic expansion marks 20th anniversary

FLUSHING, N. Y.: In a recent ceremony marking its 20th anniversary, Eutectic Welding Alloys Corp. broke ground for a 25,000 square foot, $500,000 addition to its headquarters facilities here. Rene D. Wasserman, president, said the new building, which increases floor space of the Flushing facility by 25 percent, will provide additional office, training, research, and shipping space.

At the same time, the company announced that its Southwest Welding Center had moved into expanded and improved quarters at 2366 Irving Blvd., Dallas.

## Distributor Appointments

*Glendale Optical Co., Inc.*, Valley Stream, N. Y.: Fibre-Metal Southeast, Inc., Decatur, Ga.

*Hobart Brothers Company, Troy, Ohio*: Acetylene Products Co., Indianapolis; Biscayne Welding Supply Co., Hialeh, Fla.; Duncan Equipment Co., Duncan, Okla.; Medico Industries, Inc., Pittston, Pa.; Pierce Sales & Service, Guymon, Okla.

*Hughes Aircraft Co., Vacuum Tube Products Div.*, Oceanside, Calif.: Chafin Associates, Los Angeles.

*Shielded Stud Welding Company*, Long Beach, Calif.: J. A. Cunningham Equipment, Philadelphia; Delta Oxygen Co., Memphis; Alex Latta, Ltd., Edmonton, Alberta, Canada; McDonald & Wilson Sales Co., St. Louis; Monson Welding Sales, Inc., Syracuse; G. S. Parsons Co., San Diego; R & R Welding Supply, Des Moines; Welders Supply Co., Baltimore; Curtis Wells, Ltd., Toronto, Ontario, Canada.

*Thomson Electric Welder Co.*, Lynn, Mass.: Addy & Luby Machinery Co., Detroit.

*United Welders, Inc.*, Bay City, Mich.: Thomas Kelleher Co., Minneapolis, Minn.

## Dye Oxygen Opens El Paso Branch

PHOENIX, ARIZONA: Gil V. Dye, president of Dye Oxygen Co., has announced the opening of a branch at 221 Chelsea Drive, El Paso, Texas. Bert K. Marshall is manager.

## Armour Holds Welding Conference

CHICAGO: An evaluation of electroslag welding will be one of the highlights of the 7th annual Midwest Welding Conference on February 1 and 2, 1961.

The conference, which is expected to attract nearly 300 welding engineers from industry, will be held on the campus of the Illinois Institute of Technology. It is sponsored annually by Armour Research Foundation and the Chicago Section of the American Welding Society.

Major topics to be discussed at the two-day meeting include "Welding Aluminum Freight Cars," "Control of Fabricating Costs," and "Welding of Ultra-High Strength Steel Missile Cases."

Inquiries concerning the conference should be forwarded to Harry Schwartzbart, supervisor of welding research, Armour Research Foundation, 10 W. 35th Street, Chicago 16.

# Data Offered in This Month's Ads

*Readers may obtain any of these free reference materials by circling the corresponding numbers on the Reader Service Cards*

**1: Clamps** are illustrated in a 32-page catalog. **Adjustable Clamp Co.**

**2: Call** in your Airco distributor for help with tricky welding jobs. **Air Reduction Sales Co.**

**3: Silver alloy** brazing rod that contains flux is featured. **Air Reduction Sales Co.**

**4: Spot welding** catalog is offered. **Air Reduction Sales Co., Tuffaloy Dept.**

**5: Flux coated** welding rods and their use are subject of instruction manual. **All-State Welding Alloys Co., Inc.**

**6: Abrasive cut-off** machine is described in Bulletin DH-299. **Allison-Campbell Division, American Chain & Cable Co., Inc.**

**7: Beveler** for small pieces is illustrated in literature. **American Pullmax Co., Inc.**

**8: Resistance welding** products are featured. **Ampco Metals, Inc.**

**9: Copper-silicon** alloy plate fabrication is explained. **Anaconda American Brass Co.**

**10: Hardening powder** sample is offered. **Anti-Borax Compound Co., Inc.**

**11: Low alloy electrodes** are described and illustrated. **Arcos Corp.**

**12: Stainless electrodes** are featured. **Arcos Corp.**

**13: Chipping tools** are described and illustrated. **Atlas Welding Accessories, Inc.**

**14: A punch and shear** for metal under 1/4-inch thick is featured. **Bateman Foundry & Mach. Co.**

**15: Weld grinding** is discussed. **Bay State Abrasive Products Co.**

**16: Carbon and graphite** products are listed in a catalog. **Becker Brothers Carbon Co.**

**18: Hydraulic tools** for welding and fabricating and featured in how-to-do-it booklet. **Blackhawk Mfg. Co.**

**19: Oxidation and scale** removal is subject of bulletin. **Chemclean Products Co.**

**20: Acetylene cylinders** are featured. **Coyne Cylinder Co.**

**21 & 22: Toggle clamps** (over 140 models) are featured in a catalog. **Detroit Stamping Co.**

**23: Testing problems** are discussed. **Detroit Testing Machine Co.**

**24: Electrode holders** are featured. **Duro Engineering Co.**

**25: Welding tips** and spot welding equipment are shown. **Eisler Engineering Co., Inc.**

**26: Exhaust systems** of all sizes and for all purposes are listed. **Engwald Co.**

**27: Arc welding** accessories are featured. **Erico Products Inc.**

**28: Electrode** for arc gouging and cutting is described. **Eutectic Welding Alloys Corp.**

**29: Heavy duty nibblers** are featured. **Fenway Machine Co.**

**30: Helmet and safety cap** combinations are the subject of Bulletin 39. **Fibre-Metal Products Co.**

**31: Fiber glass helmets** are described and illustrated. **Flood Safety Products Co.**

**33: Galvanizing** of small parts and weldments is described in literature. **Galv-Weld Products.**

**34: Preformed alloys** for silver brazing are listed in data book. **Goldsmith Bros. Division of National Lead Co.**

**35: Pipe cutting and beveling** machines are listed in catalog. **H & M Pipe Beveling Machine Co.**

**36: Axle assemblies,** jacks, couplers, and spindles are illustrated in catalog. **Hammer Blow Tool Co.**

**37: Portable welders** are listed in Bulletin W-158. **Harnischfeger Corp.**

**38: Gaugeless regulators** are described in a bulletin. **Harris Calorific Co.**

**39: Resistance welding** alloys and tips are featured. **Hercules Welding Products Co.**

**40: Automatic wire feed** package for gas shielded welding is featured in Bulletin DM-159. **Hobart Brothers Co.**

**41: Welding dissimilar alloy** combinations is discussed. **International Nickel Co., Inc.**

**42: Electrode holders** are listed in a catalog. **Jackson Products.**

**43: Clamps** for various uses are described. **Jewel Mfg. Co.**

**44: See your welding distributor** about arc welding supplies. **Lenco, Inc.**

**45: Engineering services** and consulting are available. **Lincoln Electric Co.**

**46: New three phase rectifier** d.c arc welder is described and illustrated. **Lincoln Electric Co.**

**47: Welding helmets** (eight different types) are featured. **Linde Company.**

**48: Welding distributors** and how they serve local needs is explained. **Linde Company.**

**49: Tip cleaners** are described in literature. **Maitlen and Benson, Inc.**

**50: Dye penetrant** inspection materials in spray cans are featured. **Magnaflux Corp.**

**51: Magnetic particle inspection** is described. **Magnaflux Corp.**

**52: Facilities,** capacities and new techniques are featured. **R. C. Mahon Company.**

**53: Lifting clamps** are described in catalog C-2. **Merrill Brothers.**

*continued on page* 88

Circle No. 75 on Reader Service Card.

**TILLMAN**

**GLOVES-GARMENTS**

**WELDORS BUY FROM YOUR DEALER**

**WELDING GLOVES MITTENS AND GARMENTS NOW IN POLY BAGS**

***BRAZILIAN DEERSKIN THE "STAY SOFT" LEATHER GLOVES AND MITTENS***

**John Tillman & Company**
1561 W. 19th St.
Long Beach, California

"Jorgensen" and "Pony"

**CLAMPS**

**Favorites in the industry for nearly sixty years. Write for free 32-page catalog.**

sold through leading distributors

**ADJUSTABLE CLAMP CO.**

"the clamp folks"
419 N. Ashland Ave., Chicago 22, Ill.

Circle No. 1 on Reader Service Card.

## DATA FEATURED IN ADS

*continued from page 87*

**54, 55, 56 & 57: Electrode selector** lists over 1,000 types and sizes. **Metal & Thermit**

**58: Reclaiming,** rebuilding and salvaging is discussed. **Metallizing Company of America.**

**59: Wire Gun** and powder gun hard-facing is described. **Metco, Inc.**

**60: Welder/power plants** are featured in literature. **Miller Electric Mfg. Co., Inc.**

**61: Prompt delivery** keeps your production on schedule. **National Cylinder Gas Division of Chemetron Corp.**

**62: Welding and cutting** outfit for general use is featured. **National Welding Equipment Co.**

**63: Renting of positioning equipment** is explained. **Ransome Company.**

**64: Hardsurfacing** information and prices offered in bulletin. **Rankin Mfg. Co.**

**65: Welding fume** removal is discussed in literature. **Ruemelin Mfg. Co.**

**66: Resistance welding** supplies are featured in a catalog. **S-M-S Corporation.**

**67: Carbide** is featured in literature. **Shawinigan Products Corp.**

**68: Portable screens,** welding gloves and safety clothes are featured. **Singer Glove Mfg. Co.**

**69: Components** of extra-heavy-duty arc welding machines are featured. **A. O. Smith Corp.**

**70: Weld cleaning** is discussed. **G. W. Smith & Sons, Inc.**

**71: Welder control** planning and service is featured. **Square D Company.**

**72: Hard-facing** is featured in several brochures. **Stoody Company.**

**73: Labor-saving** positioning devices are illustrated. **Superior Welding Co.**

**74: Cutting tip** cleaners are featured. **Thermacote Co.**

**75: Gloves and garments** for welders are described. **John Tillman & Co.**

**76: Electrodes** for resistance welding are featured in a catalog. **Tipaloy, Inc.**

**77: AC-DC 3-phase input** arc welder is described in Bulletin 7206-3. **Vickers Inc.**

**78: Gaugeless regulators,** single-stage or two-stage, are featured. **Victor Equipment**

**79: Cut-off machine** is featured. **Vogel Tool & Die Corp.**

**80: Controls** for brazing alloy flow are described in literature. **Wall Colmonoy Corp.**

**81: Weld joint** make-up for pipe is featured. **Wallace Supplies Mfg. Co.**

**82: Flux-cored $CO_2$** welding is explained. **Linde Company.**

**83: Blowtorches** which operate on natural, manufactured, or LP gas are described. **Clements Mfg. Co.**

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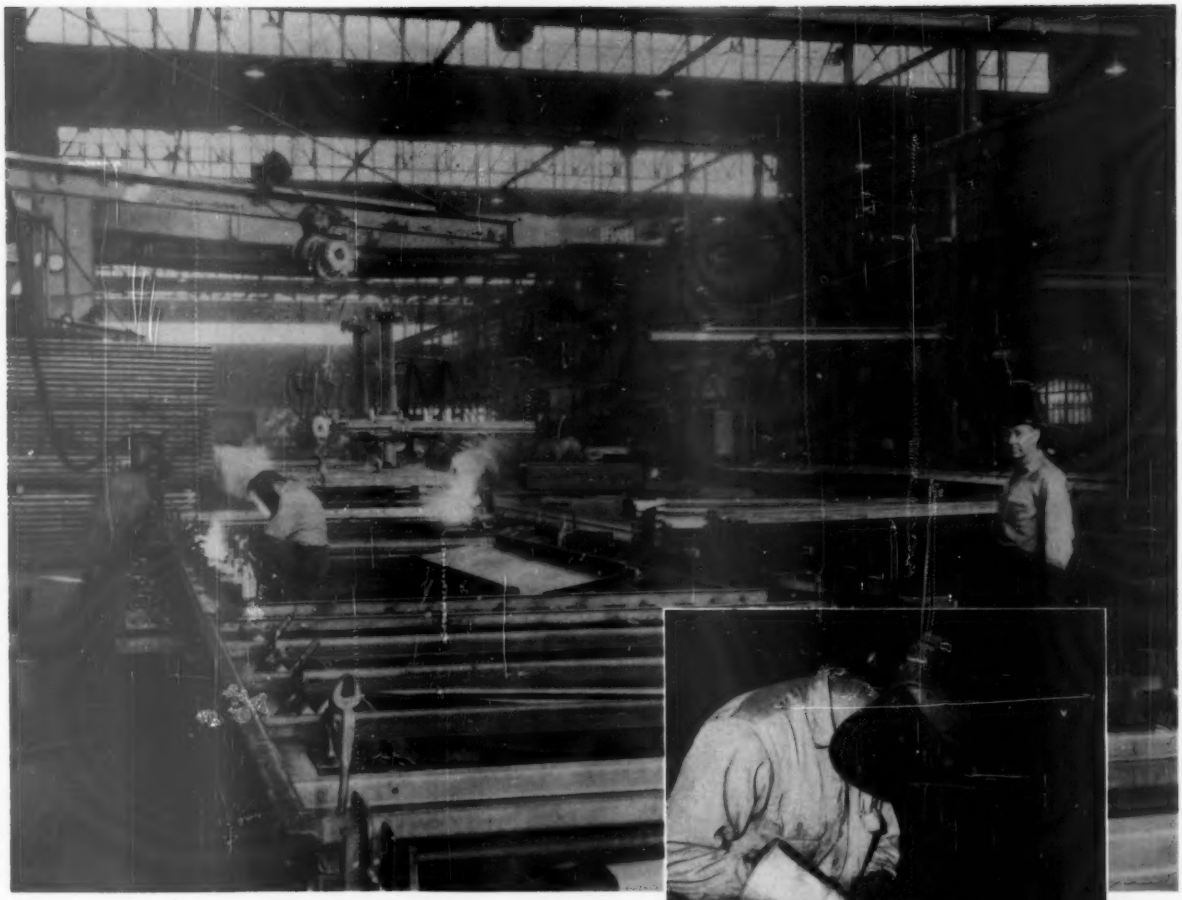

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